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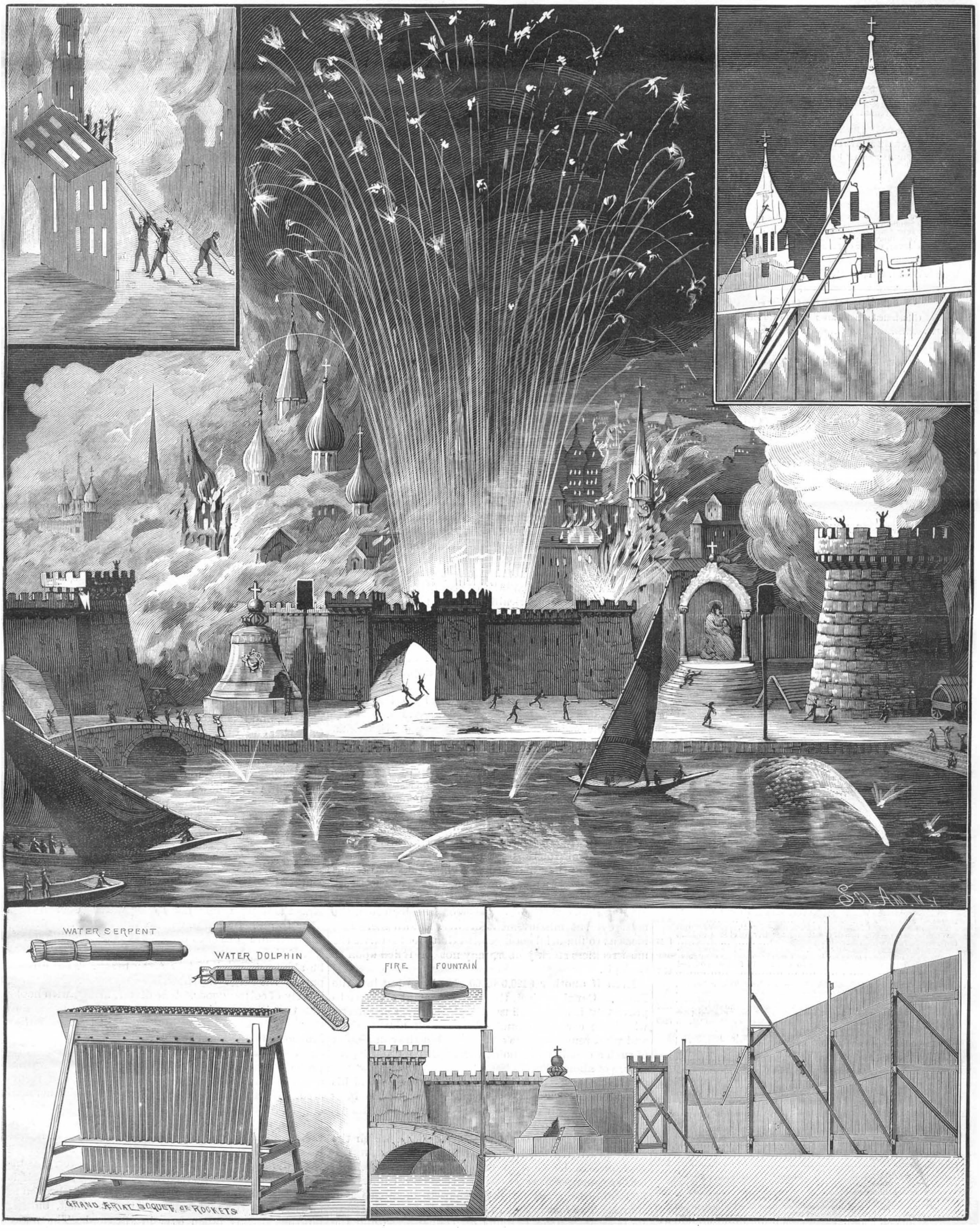

PAIN'S "BURNING OF MOSCOW."—A PYROTECHNICAL DRAMA AT MANHATTAN BEACH.—[See page 69.]

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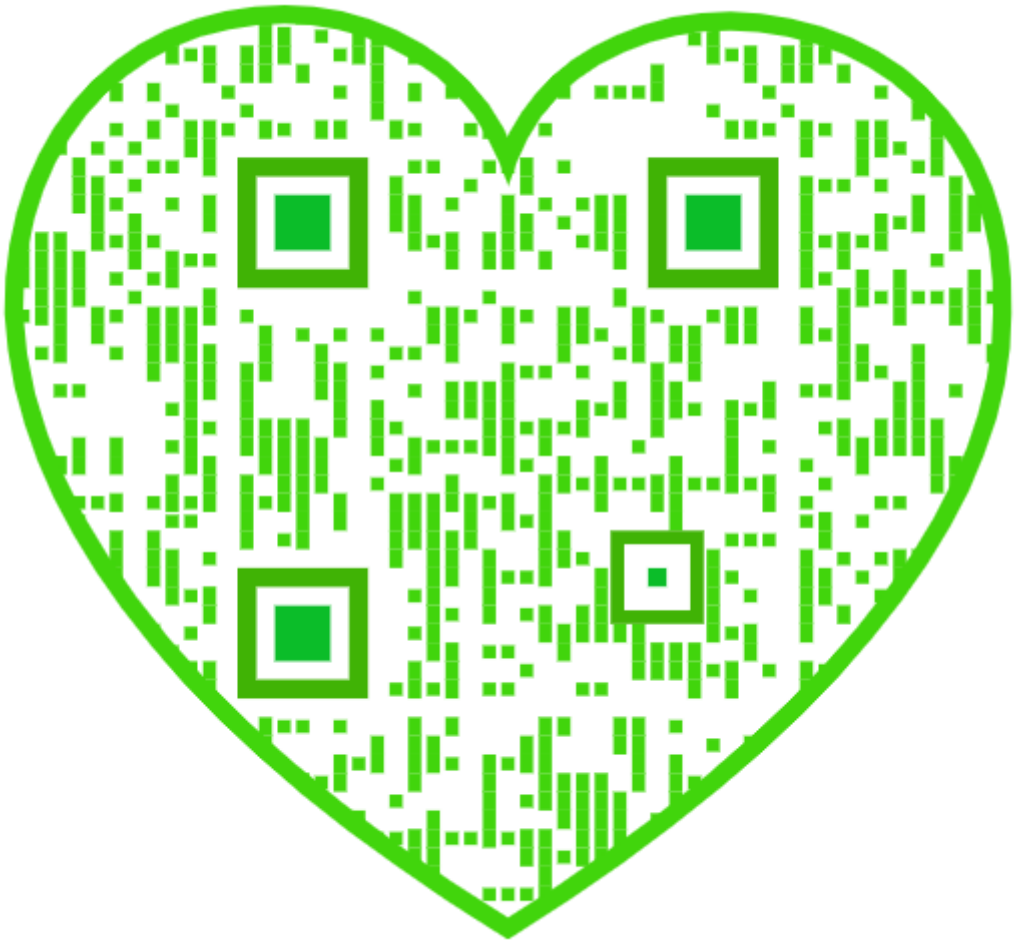

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NEW YORK ELECTRICAL SUBWAYS.

The Electrical Subway Commission, having decided that the best plan for putting the telegraph, telephone, and electric light wires underground in the city of New York consisted in a conduit of asphalt concrete, has now awarded the contract for its construction to the Consolidated Telegraph and Electrical Subway Company. The contract provides that the company shall be the servant of the Commission, and subject always to its authority; that the conduits are to be built by the company in accordance with the plans of the Commission, and maintained under such rules and regulations as it may adopt. It is stipulated also that no favoritism is to be shown to any one, and that the conduits are to be open to all companies at the same proportional rentals, which are to be fixed by the Commission.

In no case are they to exceed the cost of keeping up the wires as at present, or ten per cent upon the capital invested in constructing and maintaining the conduits. The contract has been provisionally signed, and a bond of half a million dollars executed by the company as a guarantee of the faithful performance of its duties.

The work of constructing the conduits will be begun, probably, about the middle of August, and will proceed, it is stated, at the rate of 500 feet per day. The contracting company claims to own patent rights covering the manufacture of asphaltum-concrete conduits, as recommended by the Commission, to the number of twenty-one, and to control several others in addition.

It is hardly probable, however, that the work of putting the wires underground will be permitted to proceed without the interference of an unsually large number of injunctions and lawsuits. It is still an open question, in the first place, as to whether the Commission has the authority to make such a contract.

SHIP TRANSIT ACROSS THE ISTHMUS.

It is a fact so curious as to be worthy of remark that the canal projects of Panama and Nicaragua have, almost simultaneously, met with an ill-fortune which can scarcely help to weaken the confidence of the public in their practicability. At Panama, the $120,000,000 that was to have been sufficient to pay for the construction of a tide-level canal having been expended, it was thought advisable by the promoters of the scheme to ask the French Chambers to inquire into the matter; to assure, at least, the French public that a canal at that point was feasible, and to sanction the raising by lottery or subscription of a like sum, which M. De Lesseps avers is necessary in order to surmount those unforeseen difficulties which usually present themselves in works of such magnitude. Such dilatoriness has been shown by the committee of the Chambers selected to make this examination—a dilatoriness which some allege comes from lack of proof thus far presented to it of the practicability of the project—that De Lesseps has asked M. Freycinet to take the matter out of its hands.

Whatever may have prompted the committee to withhold its sanction to the new loan after a consideration of three months, it must be apparent even to the dullest intellect that the road to success in this enterprise is not clear, and the methods by which its promoters hope to attain it by no means certain.

As to the project for a lifting lock canal at Nicaragua, which has long found favor among American engineers, the recent earthquake in the vicinity of its route sweeps away in a moment a principal argument put forward in favor of its selection. Nicaragua, we have been told, is outside the zone of earthquakes, and hence that the great works necessary to such an elaboration of waterways would remain undisturbed from those violent upheavals which periodically visit the greater portion of the Central American main.

It is within the range of probability that De Lesseps may yet discover a means of raising another $120,000,000 among his countrymen, whose faith in his ability is so abiding that even the grossest errors of calculation, the most evident misstatement of well known facts, and ideas as to financial management that would startle the most reckless stock-jobber, may not be relied upon to shake it.

Even if another $120,000,000 should be put into the Panama Canal project, there is abundant evidence to prove that it would be insufficient. Eminent engineers, who have carefully examined the work already done and what remains, have estimated that the completion of such a canal at this point will require a gross expenditure of about $500,000,000.

It is reported that M. De Lesseps recently told his countrymen that should they fail to support the Panama enterprise, it would be turned over to the Americans, who would eagerly put their dollars into it.

Those who are aware of the apathy with which the Panama scheme was received in this country at its inception will be slow to believe that now, when its earlier promises have proved so visionary, capital will be found here ready for investment in Panama Canal shares. The fact is that in this country the Eads Ship Railway across the Isthmus of Tehuantepec and the Nicaragua Ship Canal have long been the favorite projects. Ever since President Cleveland spoke in favor of the ship railway, in his message to Congress, the current of opinion has turned in that direction, and now that the route of the proposed Nicaragua Canal has proved to lie within the earthquake belt, Eads' project is thought to be the only practicable one. The strongest point in its favor, and one which cannot fail to commend it in the eyes of practical men, is that its cost can be estimated with something like certainty; for railway construction has reached that point where material, cutting and filling, and labor can be computed in advance; and as to lifting ships out of the water, and their ability to bear the strain of transportation, no other means are required than those already in successful use in the dry dock and the marine railway. Best of all, the promoters of the ship railway ask not a dollar from the Government until they have shown in actual practice the capability of their construction to transport ships from ocean to ocean.

BASEBALL.

Probably there has never been an out of door amusement which has taken the whole country so by storm as baseball playing has done this season.

The skill exhibited by the experienced players has attracted crowds of people from long distances to witness match games, and the enthusiasm manifested on the field shows that it is not a mock interest or fashion that has brought them together, but that it is the skill of the players that attracts such fabulous numbers.

The knack of a skillful "pitcher," who sends his ball so that it diverges from a straight line after leaving his hand, and curves in any direction at the will of the pitcher, so as to deceive the "batter," is an attainment which but a comparatively few have reached, but it is a science which every amateur player would like to acquire.

In another column Mr. Chadwick, who probably understands the game of baseball as well as any writer on the subject, explains his theory of the curved ball, which so many have watched with interest and so few have attempted to explain. If any one can advance any better theory as to the way the ball is held or thrust from the hand, the editor will be glad to hear from him.

A New Ocean Telegraph Circuit.

At present, when telegraphic messages are sent from the United States to Brazil, they must first be cabled to Europe, and then sent from there to their destination. This is not only a very roundabout method, but also very expensive, each word costing $2.06 for its transmission. A new enterprise has just been organized in New York for the construction of a direct cable from this port to Venezuela and Brazil. It is called, in honor of the Emperor, the Pedro Segundo American Telegraph and Cable Company, and starts out with a capital of $2,500,000. The imperial government of Brazil and republic of Venezuela have both granted very favorable concessions to the new company. Its cable will be over four thousand miles long, and is being constructed in England. It will probably be completed in a few weeks, and will be laid as soon as the equinoctial storms are over. It can be put in place in three months, and it is thought will be ready for business before the end of the year. The cable will begin at Viseu, on the coast of Brazil. It will touch at Cayenne, French Guiana, and will connect with the land lines of Venezuela at the mouth of the Orinoco River. The cable will then follow the coast, connecting with Caracas and other important points. From Venezuela it will be carried to Port au Prince, Hayti, now without cable connection, and thence directly to New York.

The Wreck of the Oregon.

Six divers are now constantly at work on the Oregon, steam pumps being used to supply them with air. Each man remains under water from a half hour to an hour at a time. By the end of that period, the pressure becomes difficult to bear. The air is forced through five-ply rubber hose, which it would be almost impossible to cut or break. The greater part of the cargo has now been removed. It consists largely of cotton goods. The divers, armed with hooks like the 'longshoremen, take hold of the bales, and transfer them to the steam pulleys by which they are hoisted on board the wrecking vessel. The average daily work accomplished is twenty bales. It is probable that the whole cargo will be removed within a few weeks. Most of the mail has also been recovered. We are still receiving magazines and other mail matter from the ill-fated vessel, but their long immersion in the sea has detracted considerably from their value. In order to get at the mail room, it was necessary to blow a hole in the side of the vessel with dynamite. Much of the mail, however, was utterly ruined before its recovery. The Oregon itself is rapidly going to pieces. Not only has she broken in two between the mainmast and the foremast, but her bow has already fallen over in the sand. The mainmast and mizzenmast are still visible above the water.

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High Speed Ships.

It is curious, says *The Engineer*, that in all these discussions concerning marine high speeds, so little is said about the power and coal wasted by friction and badly made propellers. It has long been known that of every 1,000 indicated horse power developed in a steamer, not more than 450 to 500 are utilized in driving her. Here is an enormous margin which no one attacks, and yet events occur almost daily which show that something, much or little, might be done. Thus, for example, Mr. Nichol, one of the speakers in the discussion related an experience which he had had. A ship was built on the Tyne to go at 14 knots, with fifty-five revolutions per minute. The propeller was designed, and rejected as being too small, by the superintendent engineer to the company for which the ship was built. On the trial trip the engines would only make forty-nine revolutions per minute, when the bearings heated, and a very unsatisfactory voyage as to speed was made. The cause was sought for, and found in the undue proportions of the propeller. Ten inches were cut off the top of each blade, and the engines then made fifty-five revolutions without heating and with the most satisfactory results. In the case again of the steamship John O. Scott, the propeller was very heavy, and the consumption 15 tons a day. The propeller was reduced in diameter and area, and the ship then went at the same speed, making ten revolutions more per minute, and the consumption fell to 13 tons a day. There is, our readers may rest assured, no special isolated virtue resident in expansion, or high speed, or lightness, or forced draught. Each of these things has its advantages and disadvantages, and the skill of the engineer is shown, not by advocating any one of these as a panacea for all the ills ship owners are heirs to, but by so combining the best features of all that a satisfactory result may be reached; and the engineer ought to know that the value of the result will always be estimated by the ship owners in terms of pounds, shillings, and pence, and on no other basis.

Whale Hunting by Steam.

The Monterey Whaling Company is about the oldest institution of the kind on the coast, and the stock proves a very fair investment to the holders, who are the whale killers themselves. The business office, storeroom, and eating and sleeping apartments of the company are in a white adobe building in the western suburbs, and half a mile further south is a high cliff, whereon is the company's lookout. He is armed with a powerful glass, and a tall mast is rigged with halyards for hoisting a signal when game is sighted.

The hunting tools consist of three of the regulation double-pointed boats in use by whalers the world over, five long oars to each boat, 200 fathoms of line smoothly coiled in tubs in the bow, and two guns to each boat. The larger size of the two has the proportions of a young cannon, and is mounted on a pivot. The missile discharged from it is a steel bar four feet in length, and provided with a folding barb that opens out when the harpoon buries itself in the whale. This takes the place of the old-time harpoon, and is much more certain and effective. The lighter gun is fired from the shoulder, and looks like a large-sized fowling piece. It has a 1½ inch bore. It is used to put the finishing touches on the whale after the harpoon has made him fast, and the method is to fire an explosive bomb into a vital spot. The bomb is 1½ inches in diameter by 18 inches long, the butt end being winged with rubber tips, after the manner in which an arrow is feathered, to secure guiding power.

It was early morning when the white signal fluttered to the top of the staff of the mast on the cliff; and having previously obtained permission to join the hunt with Capt. Mariano, the quartermaster was speedily seated in the stern sheets, awaiting the signal to shove off. This was soon given, and six miles to the northwest the three boats came up with their game, which proved to be an unusually large specimen of the California gray variety. The gigantic fish rolled lazily about on top of the water, all unconscious of impending danger, and did not even deign to notice the approach of the boats that came upon either side and behind her. A hundred feet away the men lay on their oars, and Capt. Mariano sighted over his swivel gun. The men bent over their oars, with every muscle ready to pull or back water at the slightest hostile movement on the part of the enemy. It was a moment that seemed an age of awful suspense to the green hand, but suddenly the captain had a fair mark presented, and pressed the trigger. The boat quivered under the shock accompanying the report, and the eye could plainly catch the flash of the harpoon as it cleaved the air and buried itself out of sight somewhere in the right shoulder. Attached to the steel missile was the stout Manila line coiled in the bow, and it bore the appearance of a flash of brown lightning as it zigzagged through the air after its powerful motor.

The whale hardly seemed to comprehend the trouble that had overtaken her at first, and it was fully half a minute before she emitted an angry snort, and started for the bottom at a rate that made the line smoke and emit sparks as it ran over the bows. Both the Captain and the boat steerer peered uneasily into the clear depths as the line stopped running out, and a minute later the former shouted: "Back all! Back hard!" The five ashen blades bent and quivered with the strain put on them, but it was none too much, as the boat was scarcely a dozen feet away when the huge bulk of the infuriated whale rose to the surface, and spurted twin columns of the brine high in the air. Before the animated waterspout could repeat the dose the boat was out of range, both of the fire extinguishing apparatus and the terrible flukes that soon commenced to thrash the water into foam. Her contortions were so violent that the captain could not get in a shot with his bomb gun, which he raised and lowered half a dozen times without pulling the trigger. Finally the flukes quit their thrashing, and like a flash the leviathan dashed away at a terrific rate, burying the boat's bow between two walls of water fully eighteen inches high, but the speed was such that scarcely a drop entered the boat. This gait was kept up for a good ten minutes, and then the speed commenced to slacken, and the wounded monster swam easily and quietly on top of the water.

The living tug came to a total standstill at last, and, pulling around to a broadside position, the captain was given his opportunity. The second explosion was followed by the whistling of the rubber-winged bomb, which buried itself in the great mass of blubber. Scarcely had the smoke cleared away from the bow before the muffled boom of the bomb exploding in the historical residence of Jonah sounded the death knell of the poor old whale. The victim's huge bulk grew animated again, but only for a moment. The flukes thrashed violently for a few seconds, while the waterspouts became tinged a warm red. Struggles and spouts became more and more contracted, until, with a last final effort, the inwardly wounded monster rolled over and expired. The other boats made fast, and a hard pull of three hours landed the prize on the beach, where it is to be cut up.—*Alta.*

Cork.

In his recent lecture on "Cork," Mr. W. Anderson said: "In this strong upright glass tube I have, at the top, a piece of India rubber, immediately below it a piece of wood, and below that a cork; the wood and the cork are loaded with metal sinkers to reduce their buoyancy. The tube is full of water, and is connected to a force pump by means of which I can impose a pressure of over 1,000 pounds per square inch. The image of the tube is now thrown on the screen, and the pressure is being applied. You see at once the cork is beginning to shrink in all directions, and now its volume is so reduced that it is incapable of floating, and sinks down to the bottom of the tube. The India rubber is absolutely unaffected. The wood does contract a little, but not sufficiently to be visible to you or to cause it to sink. I open a stop cock, and relieve the pressure; you see that the cork instantly expands, its buoyancy is restored, and it floats again. By alternately applying and taking off the pressure, I can produce the familiar effect so well known in the toy called the 'bottle imps.' It is this singular property which gives to cork its value as a means of closing the mouths of bottles. Its elasticity has not only a very considerable range, but it is very persistent. Thus in the better kind of corks used in bottling champagne and other effervescing wines, you are all familiar with the extent to which the corks expand the instant they escape from the bottles. I have measured this expansion, and find it to amount to an increase of volume of 75 per cent, even after the corks have been kept in a state of compression in the bottles for ten years. If the cork is steeped in hot water, the volume continues to increase till it attains nearly three times that which it occupied in the neck of the bottle."

The Race of the Steam Yachts.

On July 15, the American Club races came off over the 90 mile course on Long Island Sound, between Larchmont and New London. The very unfavorable weather of the previous evening made the number of attendant yachts much smaller than usual, but otherwise the race was a complete success. In the first class only two yachts were entered, the Atalanta and the Yosemite. The best time was made by the Atalanta, which steamed over the course at an average speed of 19·64 miles an hour. This gives her the custody of the Commodore's Cup for another year. She would also be entitled to the class prize, but the rules of the club provide that only one prize can be taken by any yacht. Consequently the Atalanta has her choice of prizes, the Yosemite taking the second. In the second class the Lagonda was the victor, and in the third the Nereid. The principal feature of this year's race was the remarkable performance of the steam launch Henrietta, which has been recently built by the Messrs. Herreshoff for Mr. Norman L. Munro. The vessel has only a length of 46 feet 7 inches on the water line. She was not entered for the race, but started out from Larchmont with the yachts of the second class. Before the course was half covered, she was out of sight. Her average speed was 16·75 miles an hour.

Tea Drinkers' Diseases.

It is not a little curious that the diseases arising from the wrong use of tea should be met with in greater frequency in countries foreign to its growth. It might have been supposed that where production went on, there would be found those evils that attend the consumption of tea in their greatest extent; but such does not appear to be the case. The diseases due to tea are well known to doctors, but the public seem to be strangely indifferent to the teachings of their medical advisers in these matters. Recently, in France, M. Eloy has reminded medical men how vast is the number of diseases owning an allegiance to the dominion of Queen Tea. The list of headings in M. Eloy's paper is well calculated to arouse attention, and, we hope, to lead to some abatement of this widespread disorder. America and England are the two countries that are afflicted most with the maladies arising from the excessive consumption of tea. Individuals may suffer in a variety of ways. It is customary to speak of acute, subacute, and chronic "theism"—a form that has no connection with theological matters. It is possible to be a "theic" by profession or a "theic" by passion. The predominance of nervous symptoms is a characteristic of theism; general excitation of the functions of the nervous system may be observed; or the weakness may be noted more especially in the brain as distinguished from the spinal cord. Perversion of the sense of hearing is not at all an uncommon symptom—patients hearing voices that have no real or objective existence. The irritability that overtakes women so frequently may sometimes be clearly traced to an excessive indulgence in afternoon tea. It is a mistake to suppose that it is the poor seamstress who is the chief sufferer from theism. No doubt the tannin which tea that has been standing long contains does a great amount of mischief, but the derangement that it causes hardly belongs to that class of diseases with which we are at present concerned. Rather does theism belong to that genus of disease in which morphinism, caffeism, and vanillism are found. The habit of tea drinking is one that grows on its victims like the similar ones of opium or alcohol. Taken in strict moderation, and with due precautions in the mode of preparation, tea is, like alcohol, a valuable stimulant; in its abuse there is also a certain analogy. There is hardly a morbid symptom which may not be traceable to tea as its cause. This is a fact that general practitioners often use to their own satisfaction and to their patient's advantage, if it happen to be that kind of patient who does not object to make some sacrifice in order to be rid of troubles.—*Lancet.*

Struck by a Meteor.

A correspondent writes: "As a gentleman, a well known public official, was passing from St. James's Park into Pall Mall by the garden wall of Marlborough House, recently, at a quarter to 5 in the afternoon, he suddenly received on the right shoulder a violent blow, accompanied by a loud crackling noise, which caused him great pain and to stumble forward as he walked. On recovering his footing, and turning round to see who had so unceremoniously struck him, he found that there was no one on the pavement but himself and the policeman on duty at the park end of it. On reaching home the shoulder was submitted to examination, but nothing was at first discovered to account for the pain in it. But in a little while the servant who had taken away the coat to brush brought it back to point out that over the right shoulder the nap was pressed down flat in a long, straight line, exactly as if a hot wire had been sharply drawn across the cloth. The accident is therefore explained as having been caused by the explosion of a minute falling star or meteor. It is an unprecedented and most interesting occurrence, and deserves, I think, to be placed on public record."—*London Times.*

Ingenious Petty Swindlers.

The ingenious ways some persons adopt to avoid paying out their money seem incredible to those whose walks in life do not bring them in contact with large numbers of people. "Here is the latest (from the *Railway Review*) to beat us poor conductors out of our fare," said one of the fraternity the other day. "While taking up the tickets, I reached a nicely dressed lady, who was looking, apparently preoccupied, out of the open car window and tapping her pocketbook on the window ledge. I touched her shoulder to attract her attention, when she jumped as though shot, and dropped her pocketbook out of the car window. She began to cry, and what could I do? Pass her, of course, which I did. I noted the place of the accident, stopped for the pocketbook the next trip, and found its contents to be a postage stamp and a card of hooks and eyes. I felt pretty cheap then."

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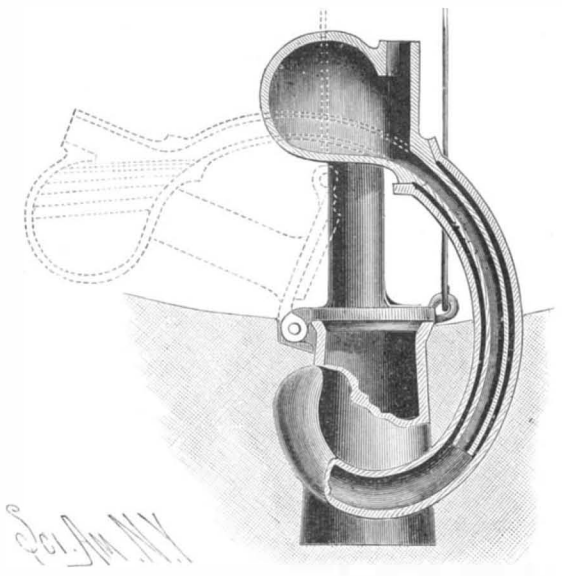
DISCHARGE PIPE FOR VAULTS.

Flush with the bottom of the vault is a discharge pipe, which flares toward its lower end, so that whatever enters its mouth will pass readily through. The mouth is provided with a hinged cap, serving as a valve, which is opened by means of a rod attached to a perforated lug opposite the hinge and extended so as to be easily operated from a place above the vault. Opening into the discharge pipe is a curved pipe that forms a U-shaped trap extending through the bottom of the vault and to any desired height above. The end of the curved pipe is flared to form a seat for the conical collar placed upon a similarly curved pipe slipping



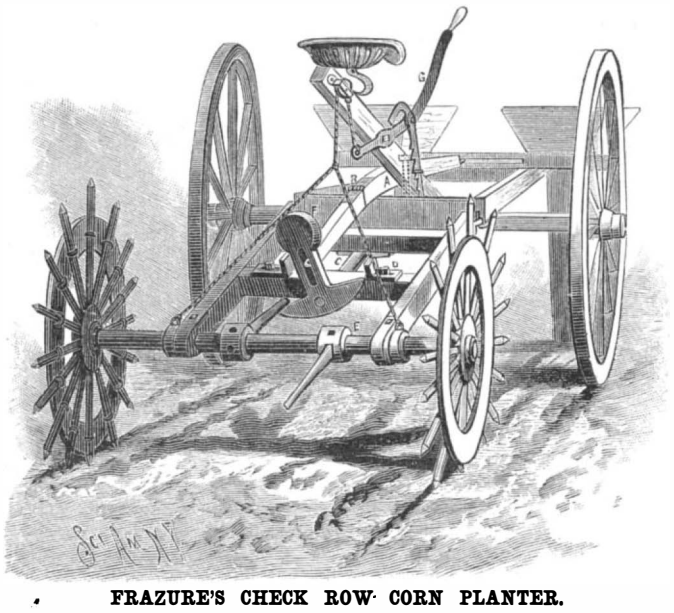
BEARD'S DISCHARGE PIPE FOR VAULTS.

within it. Upon the upper end of the inner pipe is a chamber or receiver, upon the upper part of which is a pipe of such length as the depth of the vault may require, so that it will serve as an overflow, the liquid passing through the curved discharge and drain pipes into the sewer. The chamber is attached to a standard formed upon the cap. When the vault is to be emptied, the cap is turned back, when the chamber occupies the p sition shown by the dotted lines, and becomes filled with liquid. After the vault has been emptied, the cap is turned back, thereby causing the liquid to fill the trap and prevent the escape of sewer gas from the discharge pipe into the vault, in case the liquid in the trap has been drawn out by the overflow of the contents of the vault through the discharge pipe.

This invention has been patented by Mr. Joseph Beard, of 26 Swan Street, South Boston, Mass.

CHECK ROW CORN PLANTER.

The check row corn planter herewith illustrated is the invention of Mr. James Frazure, of Kearney, Neb. Upon each end of the shaft, E, is fixed a check row wheel, preferably having sixteen radial fingers. The shaft is mounted in bearings at the rear end of a supporting frame, and carries the arms, E, which, as the



FRAZURE'S CHECK ROW CORN PLANTER.

shaft revolves, strike fingers formed upon a lever, F, carried by the shaft, C, thereby oscillating the lever and imparting motion to the lever, A, which controls the slides within the hoppers. The movement of the slide is thus controlled directly by the distance traveled, so that there will be an absolute uniformity in the spaces between the points at which the corn is dropped. The check row attachment is connected to the corn planter by means of clevises. When desirable, the attachment can be elevated from its position upon the ground by a lever, G, one end of which is connected by ropes with the axle, E, the other end being held by a toothed catch arm. When the check row attachment is not wanted, it can be removed from the planter. The throw of the lever, F, and thereby the control of the amount of feed delivered from the hoppers, is limited by the adjustable stops, D. When it is desired to plant in drills, two or more additional fingers are mounted on the shaft, E, to impart a more rapid motion to the slides. The lever, A, is formed of two sections hinged at B.

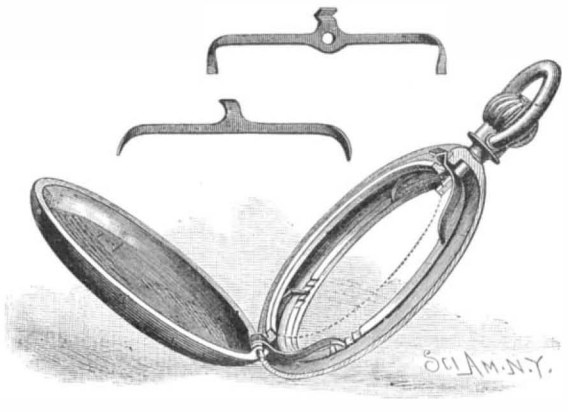
Exports of Wheat.

In the five months ending with May last the exports from San Francisco and Portland, Ore., compare as follows with those from all Atlantic ports: Pacific ports, 13,291,687; Atlantic ports, 13,916,770; total, 27,208,457; per cent from Pacific, 48·8. The Pacific coast, however, exports but little flour, comparatively, while the Atlantic ports exported the equivalent of 12,214,426 bushels in flour this, and 18,627,970 last year.

WATCHCASE SPRING.

These springs are used for throwing and locking the hinged cap of a watchcase. The form of the springs is clearly shown in the upper views, while their position in the case is shown in the lower cut. The lug of one spring is shaped to form a notch, for the purpose of engaging and holding the hinged cap; the lug of the other spring rests against the cap, directly above the spring, so that when the cap is released the spring can throw it. The ends of the springs engage with ratchets formed on the inner side of the ring of the case.

This spring—the invention of Mr. Robert L. Stufft, of Scottdale, Pa.—can be very easily and rapidly secured in the case, as it requires no screws or other fastening device, and as the lug can be filed off at the bevel to fit cases of different thicknesses. This makes it possible to fit almost any case with a catch spring, if only one spring is in stock, thereby relieving the repairer of



STUFFT'S WATCHCASE SPRING.

the necessity of always having springs of different sizes on hand in order to be able to fit all kinds of cases.

A Gravity Spring Balance.

Sir William Thomson has just brought under the notice of the Royal Society of Edinburgh a new form of spring balance, which he has devised for measuring terrestrial gravity.

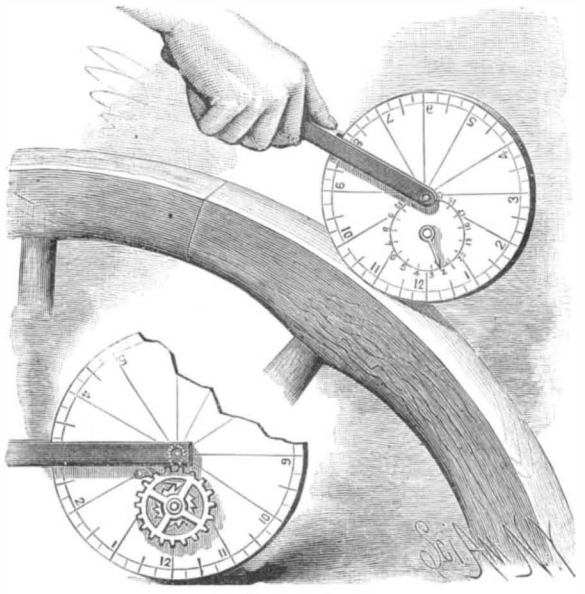
The instrument has as its main feature a thin flat plate of springy German silver, which is 75 centimeters in length by 2 centimeters in breadth. To one end of the spring there is secured a brass weight of 2 grammes; and as that end of the spring is 2 per cent heavier than the other, it keeps the spring straight when the other end is horizontally fixed. This fixed end is securely fastened in the lower end of a brass tube of about 8 centimeters in diameter, inclined at a slope of about 1 inch in 5 inches, with the weighted end thus above the level of the fixed end. By this arrangement, the spring is brought into a condition of very nearly unstable equilibrium. The upper end of the tube is covered with glass, and through this the spring is viewed.

By means of a micrometer screw, the weight which is attached to the free end of the spring can be adjusted, and the observation consists in marking the number of turns of the micrometer screw which may be required to bring the weight from the balanced position to the level position. According to Sir William Thomson, such an apparatus as he has constructed is sensible to a forty-thousandth of the force of gravity. It is affected, however, by differences of temperature to the extent of one-twentieth of a degree Centigrade. The only difficulty to be got over, in the opinion of the inventor, is a tendency of the metal to "creep."

To make mockingbird food, take of hempseed 3 parts, toasted wheat bread 2 parts, maw seed 1 part, ox heart 1 part. Boil the ox heart well in water, cut it small, and place it in a pan in an oven, where it must be allowed to become perfectly dry and crisp. All the ingredients must then be thoroughly mixed and ground in a mill to coarse powder.

MEASURING WHEEL.

The wheel has a graduated periphery, and is mounted loosely upon a shaft carried by a forked handle. Formed upon the shaft is a lug, which engages at each revolution with a toothed wheel whose shaft carries a pointer, revolving upon a dial. The backward movement of the toothed wheel is prevented by a pawl and ratchet. The main wheel is, preferably, 12 inches in circumference, and is divided into twelve equal parts, subdivisions indicating the fractional parts of an inch. To measure any distance, the wheel is placed so that the division marked 12 will be upon the starting point, and is then moved forward. When the distance to be



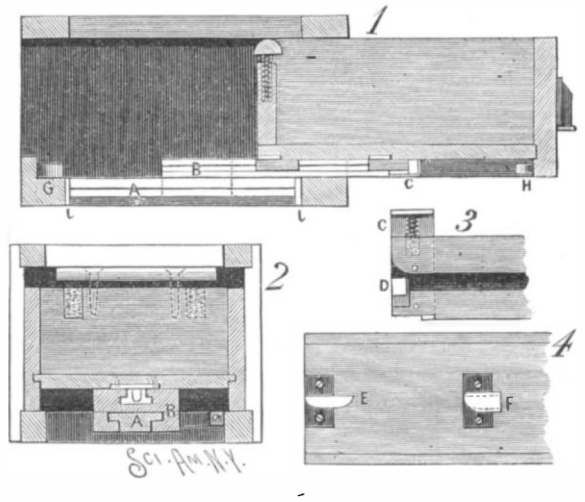
McCALEB'S MEASURING WEEEL.

measured is less than one foot, it may be read by noting the division of the wheel opposite the stopping point. When used for measuring lengths of pipe, the wheel is provided with guiding plates secured to each of its faces and projecting out beyond the periphery.

This invention has been patented by Mr. John L. McCaleb, of Benton, Texas.

DRAWER CHECK AND SUPPORT.

Secured between the front and rear lower cross bars of the frame is a T-shaped strip, A, upon which moves a slide, B, having an inverted T-shaped groove formed on its upper side, as shown in the longitudinal vertical section Fig. 1, and the cross section, Fig. 2. Upon the bottom of the drawer, just back of the center, is secured a T-shaped lug, F, by means of screws passing through slots in the top plate of the lug. At the rear end of the drawer bottom is a lug, F, Fig. 4, similarly secured. The rear ends of both lugs are rounded off. The lugs are inserted in the groove in the slide, B, so that the drawer may be shoved back within its case. The drawer is prevented from being drawn out too far by a sliding plate, C, Fig. 3, fixed to the under side of the forward end of the slide, B. This plate carries a stop, D, which is normally held in front of the groove by a spring. Springs are provided for lessening the shock and noise incident to opening and closing the drawer. Above the rear end of the drawer is a strip, pressed against the



FRASER'S DRAWER CHECK AND SUPPORT.

under side of the upper cross bar of the frame when the drawer is drawn out. As the drawer is pulled forward the lug, F, strikes the stops, D; the continued movement of the drawer causes the slide, B, to be drawn forward until one of the blocks by which it is held to the strip, A, strikes a spring on the forward part of the case. To remove the drawer from the case the plate, C, is pressed to carry the lug, D, from the front of the groove, thereby clearing the passage for the lugs, F. The advantages of constructing a drawer as described, the saving of material and labor, and the easy operation attained, are apparent.

This invention has been patented by Mr. S. J. Fraser, of 69 Worthen St., Lowell, Mass.

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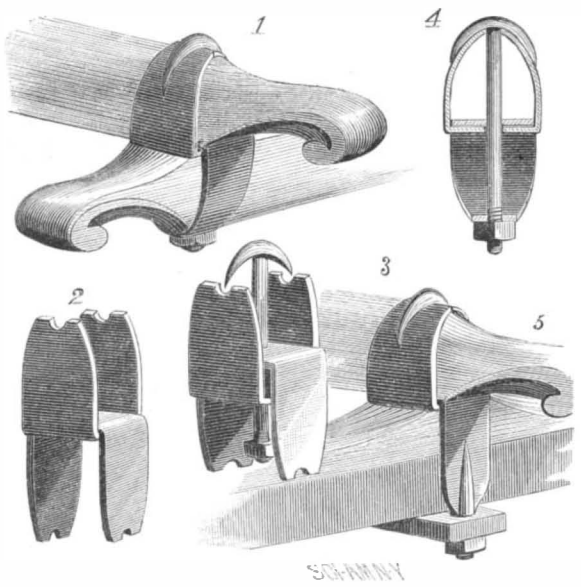
CLIP COUPLING FOR VEHICLES.

The clip coupling shown in Figs. 1, 3, and 4 is made of two suitable metal plates shaped as clearly shown. In using this coupling to clip a wagon side bar to a head block, the side bar is placed between the side parts of the upper plate, and the head block between the side parts of the lower plate. The clip bolt is then passed through suitable holes, and the side parts are bent inward to conform to the surfaces of the side bar and head block, the end notches in the plates inclosing the bolt immediately beneath its curved head and inside of its nut. When the nut is tightened, the curved head will hold the sides of the upper plate to the side



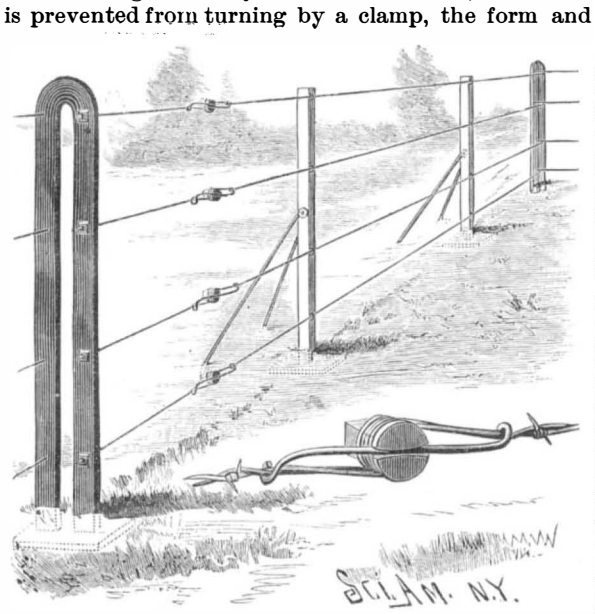
TYLEE'S CLIP COUPLING FOR VEHICLES.

bar, and the nut will hold the sides of the lower plate. It is evident that this coupling is very light and strong, of a neat appearance, and its use prevents splitting of the wood. The clip may be made of a single piece of metal, as shown in Fig. 2. How a side bar may be clipped directly to an axle is very clearly shown in Fig. 5.

This invention has been patented by Mr. James E. Tylee. Further particulars may be had by addressing Mr. Ben. S. Clarke, of Ashland, Neb.

FENCE WIRE TIGHTENER.

This simple and effective device, wherewith the undue slackness of fence wires may be taken up at any time, is the invention of Mr. T. C. Histed, of Cherry Vale, Kas. The wires pass through holes in the end posts of one section of the fence, and project far enough to receive spiral springs between the posts and buttons fixed to the ends of the wires. These springs provide for the expansion and contraction of the wires by changes in temperature. Upon each wire of each section of fence is placed a tension roller, formed with a squared hub at one side, to which a wrench may be applied for turning it. Its opposite end has a diametrical slot to receive the fence wire. After the wire has been tightened by and on the roller, the latter is prevented from turning by a clamp, the form and



HISTED'S FENCE WIRE TIGHTENER.

application of which are clearly shown in the small view. By means of this device a fence may, with very little attention, be kept in good condition as long as the wires last.

The Eruption of Etna.

The following particulars of the recent eruption of Mount Etna have been furnished by M. Silvestri, the well-known authority on these matters. The eruption began at half an hour after midnight on May 19, and lasted twenty days, that is to say, until June 7. The climax of the eruption took place on the night of the 23d of May, and after an intermittent action for several days, the phenomenon gradually abated. The eruption emanated from a "crater of ejection" and a system of "mouths," or as they are locally termed *bocca di fuoco*. The crater of ejection was formed at an altitude of 1,400 meters above the level of the sea, and in the valley between Mont Nero on the north and Mont Grasso on the south. This crater soon became a hillock, however, owing to the matter ejected. The mouths emitting lava were also in this part of the mountain, and it is calculated that they poured out from 40 to 60 cubic meters of lava a second. During the first three days the lava flowed about 4 kilometers, with an initial speed of 40 to 60 meters per minute near the mouths. This speed, however, was reduced to from 18 to 20 meters per hour on the extreme front of the advancing flow. After the 24th of May the crater threw out great quantities of sand, which produced a thick fog, and fell in abundance during several days in Sicily and Calabria. This ejection of sand characterizes the decreasing phase of a volcanic eruption. On the 29th of May, the eruption having declined, repeated earthquake shocks were heard; one of special violence on the night of June 2, when some houses in Aci-Patane were fractured. The strongest shock, however, was felt on June 5, about fifteen minutes after noon. This brought some buildings to the ground, and was characterized by an undulatory movement lasting from eight to ten seconds. The central crater of Etna also emitted great volumes of thick smoke and fine ashes on June 2, and the air is still charged with these emissions.

Oil Fuel not Economical.

From Glasgow, the *Shipping World* says, "comes evidence of an unmistakable character that oil has been tried and found wanting. The managers of the Laird line, after a long trial of oil on board one of their steamers, have decided, on purely economic grounds, to abandon altogether the use of oil as a fuel, having ascertained from practical tests extending over a considerable period that coal is the cheaper fuel of the two. Accordingly, they have had the oil tanks taken out of their vessel, and have returned to the use of coal, notwithstanding the fact that the oil tanks and the apparatus for accomplishing complete combustion of the oil cost a considerable sum of money. Although considerable ingenuity has been displayed, and several difficulties have been overcome, there is nothing in the latest apparatus and arrangements which have been adopted in Southeastern Russia, where petroleum has been extensively used as fuel, which appears likely to expedite the adoption of liquid fuel in our mercantile marine. There is little probability of petroleum being sold in this country at a price which will enable it to take the place of coal."

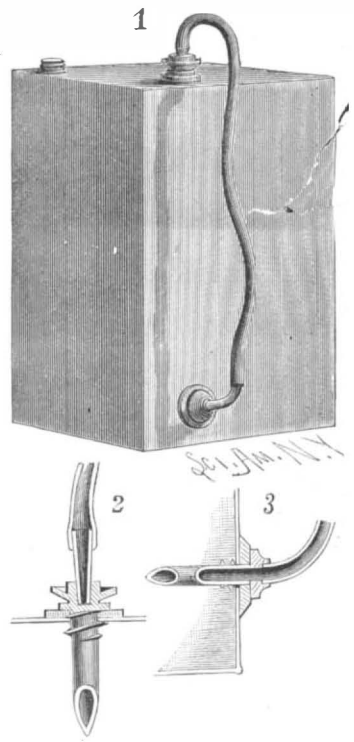
Panama Canal.

The Panama Canal Committee resolved on the 28th of June to ask five of the Ministers to confer with it. Although the Committee, which was nominated by a very thin attendance in the Bureaux, is hostile to the scheme, these explanations may modify its views. Even, however, should its report be adverse, it will be difficult, if not impossible, for the Chamber to refuse to sanction the lottery loan of 600,000,000f., required by the company for the completion of the canal. It is admitted that M. De Lesseps did not foresee all the technical and climatic difficulties with which he would have to cope. If the works commenced, and now far advanced, had to be abandoned by the present company, the Americans would take its place, reaping the entire fruits of what has been done; while the French investors would have no equivalent whatever for their sacrifices. The *Times* Paris correspondent says: "It being certain that if France abandons the enterprise, America will take it up and complete it for her own exclusive profit, it cannot be supposed that the Chamber will debar the shareholders from their chance of sooner or later being recouped for their outlay when the canal begins, like that of Suez, to realize profits. The inference is therefore that, despite all the difficulties springing up in the company's way, the bill will pass the Chamber, which can scarcely pretend to be more mindful of the subscribers' interests than the subscribers themselves are."

The London *Times* correspondent is mistaken in asserting that the Americans will take up the Panama Canal project if the French abandon it. There is not the slightest evidence of any such desire or intention on the part of the people of this country. The Americans, with their new dredgers, have dug out, for good pay, employed by the French, the short section of the canal that goes through soft ground, on this side of the isthmus—the only part so far completed. The Americans built the Panama Railroad, and sold it out to the French at an enormous profit. They have also built three lines of railway across their own domain; and they expect soon to construct a great ship railway over the Isthmus of Tehuantepec. But they have no idea of undertaking such an unprofitable scheme as the Panama Canal.

LAMP FILLING ATTACHMENT FOR OIL CANS.

The attachment consists of a flexible tube, one end of which is connected to a metallic tube, Fig. 3, formed with a sharp steel point. This tube has a collar, below which is a prominent screw thread, and its extending end is bent to form a handle or lever. The other end of the flexible tube is secured to a nozzle Fig. 2, fitting within the socket of a venting attachment consisting of a steel pointed tube formed with a collar, thread, and milled thumb nut. The attachment is secured to the can by forcing the steel point through the can and then turning, to make the collar firmly clasp a rubber gasket placed between it and the can. The venting attachment is placed in the top, and the other in one side, near the bottom of the can. When the liquid is to be drawn from the can the nozzle is inserted in the vessel to be filled, which is lowered below the level of the liquid in the can. After the vessel has been filled, the nozzle is placed within the socket, as shown in Fig. 1, thus practically closing the can, and preventing the evaporation of its contents.

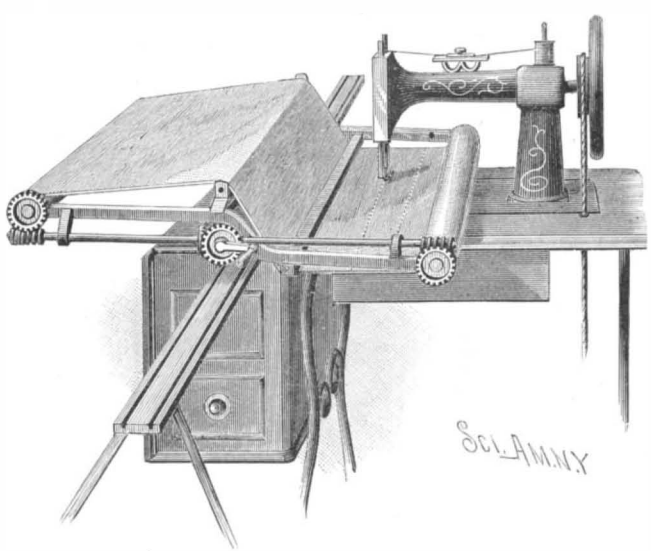


McFARLAND'S LAMP FILLING ATTACHMENT FOR OIL CANS.

This invention has been patented by Mr. James M. McFarland, of Virginia City, Nevada.

IMPROVED QUILTING FRAME.

Journaled in one end of the side pieces of the frame is a roller, on which the quilt is first wound, while at the other end is a second roller, on which the quilt is wound as the quilting proceeds. The second roller is of larger diameter than the first, in order to always keep the quilt taut. In passing from one roller to the other the quilt passes first under a cross bar or brace, and thence over a roller. Journaled in blocks on one of the side pieces is a shaft formed with a worm at each end; these worms mesh with wheels on the ends of the rollers, so that when the shaft is revolved the rollers turn in opposite directions. When at rest, the worms prevent the rollers from revolving, and the quilt is thus kept taut without the use of ratchet and ratchet wheels. The shaft is revolved by means of a crank and suitably arranged gears. The side bars are bent as shown in the engraving, and the frame is thereby permitted to be moved readily across the machine table



WRIGHT'S IMPROVED QUILTING FRAME.

with but little friction, and the quilt is brought close to the table. This quilting frame is very easy to operate, as it is only necessary to turn the crank to shift the quilt as the work proceeds, and it is durable and not liable to get out of order.

This invention has been patented by Mr. John E. Wright, of Corydon, Iowa.

LIGHTNING struck an oak in Tippecanoe County, Indiana, and tore it into splinters. It is said that each year's layer of the growth seemed to have been separated from the other, and split into strips about half an inch wide. After completing its work on the oak, the lightning ran thirty yards along a wire fence.

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Renovating Old Trees.

In very old trees, restorative measures often fail to produce any lasting improvement. But in the case of trees that are still comparatively young, and which may be suffering from neglect of some kind, and are not deficient in vitality, renovating measures are often attended with most satisfactory results. It takes time, however, and patience must be exercised. What has been going wrong, may be for years, will require a proportionately long period to be put right again, but the progress of improvement will be more rapid every year. This is owing to the peculiarities of tree growth. Improvement always, of course, takes the shape of better growth, healthy foilage, and stronger wood. These in turn deposit fresh layers of tissue, which promote a more active circulation of the juices every season, the effects of which are observable in the more rapid distention of the trunk and limbs and a proportionate increase in the roots, till, in time, the tree grows out of its debility, and recovers. Old fruit trees are oftener operated upon in this way than other subjects, and there are few gardeners who are not familiar with examples of old or feeble vines or peaches, etc., that have, so to speak, been made to renew their youth in the course of a few years. Feeble-growing and unhealthy trees are, as a rule, the result of starvation, bad soil, or unfavorable conditions of the atmosphere, climatic or otherwise. When a tree dies from old age, the signs are plain enough, and very little can be done to help it except taking great care of the scant foliage it puts forth each year, and encouraging young growth by every means to sustain the flickering vitality; but in other cases the same signs are observable in young trees, the causes of which may be found and removed. One of the surest signs of debility is the pushing of adventitious growths from the trunk and main branches, and the dying off year by year of the twiggy terminal shoots. The sap does not circulate freely to the extremities, but chiefly about the trunk, putting out a feeble growth on those parts which grow stronger the nearer they approach the root. Old laurels often afford very good examples of this.

When the tree is healthy, the top is luxuriant; when it is weak or old, the top dies, or makes little or no growth, and small shoots sprout out all over the trunk. Very often, when such bushes are cut over, they push from the base and do well; and if aided by a good soil put to the roots, the result will be all the more satisfactory. In fact, renovating measures may be said to consist in the judicious removal of the feeble decaying tops and branches, and encouraging fresh root action. The trees should be pruned rather late in the spring, when growth is about commencing, and only the really diseased or dead portions should be cut away. This having been done, the roots should be examined, and, if there be reason to suppose that water stagnates about them, the site should be drained thoroughly. In such a case, that of itself will effect a cure. We remember once a case of several young trees that were mysteriously dying off year after year at the extremities of their shoots, a wet soil not being suspected as the cause, because the whole ground had been drained years before.

The accidental digging of a pit near where they grew, however, revealed the water standing within 15 inches of the surface, owing to the main drain having been choked up. We need not say the obstruction was removed, and the soil and trees both presented a better appearance afterward. But it is not so often that want of drainage is the cause of trees dying. In thin, indifferent soils the cause is simply want of sufficient nourishment and drought—both bad in themselves; and the cure is a good layer of fresh soil, common manure, leaf mould, and the like laid over the roots, and thorough watering during the summer whenever the ground is the least dry. Only those acquainted with such matters know how dry the soil becomes where the roots of trees abound, and it takes much water to soak it afterward. The fresh soil and the water will work wonders. The effects will not be very apparent the first season, unless it be in the production of numerous buds and small growths from the older wood; but the next year, and years following, the progress will be very marked, till the tree quite fills up with young, healthy growth again. This is observable in the case of all evergreens, but especially in yews, hollies, and rhododendrons, etc. Conifers, too, reciprocate such generous treatment, but they must not be allowed to go too far, as it would then be almost as well to plant fresh trees.

At the present time, or perhaps next summer, we need not be surprised to see many trees showing signs of debility, because the soil got too dry last year, and in many places has not yet had sufficient rain to soak it thoroughly. Consequently, unless the rainfall of the coming months is sufficient, deep-rooting trees will suffer, not only from drought, but from want of food, because without water the roots cannot avail themselves of the food that is in the soil. We have frequently noticed trees that have shown the first signs of decay the season after a long drought, as in 1868, which was succeeded by dry seasons. For want of sufficient moisture, a tree may starve with its roots in the midst of plenty. No plant affords a more striking example of the effects of renovating measures than the vine. Old plants that have become bark-bound will, after being lifted at the root and allowed more development at the top, rend their old bark in all directions, and swell up to twice the thickness they were before, and that in two or three years, the leaves and crops augmenting proportionately. We have seen feeble old vines eighty years old quite restored in this way, and produce fine young wood of greater girth than the old stems, and bear remarkably fine fruit that took prizes at exhibitions.—*J. S., in The Garden.*

Wanted, a Novelty.

Long ago was it declared, "There is no new thing under the sun;" and the sentence is one of the most familiar and oft-quoted, because its truth is so frequently brought home to us.

Every now and then we read in the newspapers of some wonderful mechanical invention or unexpected development of science. We hug to ourselves the idea that at last we are in possession of a novelty, and a wonderful one to boot; but, as a matter of fact, we have as yet rarely, if at all, hit on anything that has not been at least thought of and striven for before.

When the "Art of Flying" shall be at last attained, it will be no novelty to the unfortunate inventor immortalized in the "Mark of Cain;" and if people only hunt up the authorities on the subject—and a capital list is given in the book—they will see in the successful flying machine quite an old idea, to which success was long denied. In the same way, the wonders of our nineteenth century are all children of a past period.

We unite in hailing the electric telegraph as the wonder of the age; but the idea is as old as 1637, at least. Scherwenter, in his "Delassements Physico-Mathematiques," published in that year, explains how two individuals can communicate with each other by means of the magnetic needle. In 1746 Le Monnier, by a series of experiments in the Royal Gardens in Paris, showed how electricity could be transmitted through iron wire, 950 fathoms in length; and in 1753 there was a remarkable description of the electric telegraph in the *Scots Magazine*, in an article entitled "An Expeditious Method of Conveying Intelligence," by Charles Marshall. In 1774 we find an electric telegraph in full working order, and capable of transmitting messages. This was the invention of George Louis Lesage, Professor of Mathematics at Geneva, who announced it in 1760, so fully assured was he of successfully carrying out his idea. His instrument was composed of twenty-four metallic wires, separate from each other, and inclosed in a non-conducting substance. Each wire ended in a stalk, mounted with a little ball of elder wood, suspended by a silk thread. When a stream of electricity, no matter how slight, was sent through the wire, the elder-ball at the end was repelled, such movement designating some letter of the alphabet. A few years later, in Arthur Young's "Travels in France," we read of a similar machine, the invention of a M. Lomond, of Paris.

Photography is making such rapid strides that we are almost inclined to believe it a novelty, the beautiful pictures we now obtain by its aid in the hands of accomplished artists are so superior to the daubs that satisfied our grandfathers. But the photography of the present is after all only a skillful development of a very old idea. Sun-painting by the daguerreotype was known to Leonardo da Vinci in the fifteenth century. The art then lay in oblivion till 1760, when it was clearly indicated in a book published in Paris, entitled "Giphantie," written by Tiphanie de la Roche. Josiah Wedgwood, Sir Humphry Davy, and James Watt made experiments on the action of light upon nitrate of silver at the beginning of the present century, and that their efforts were attended with some success is proved by the fact that many years afterward, among the old household lumber of Watt's partner, Matthew Boulton, was found a representation of the old premises at Soho on a silvered copper plate, apparently taken by some such process.

We often hear the Thames tunnel cited as an example of the wonderful genius of modern engineering, but the tunnel under the Euphrates at ancient Babylon was equally wonderful, and that under the wide mouth of the harbor at Marseilles was a far greater enterprise, while both these ancient works were as skillfully executed as the modern.

In the Museum of the Arsenal at Venice there are numerous firearms of the fifteenth and sixteenth centuries that forestall many of our most recent improvements, such as revolving pistols, rifled muskets, and breech loading cannon. The latter, which, as Sir William Armstrong's, may be considered quite a modern idea, strange to say had been fished up from the Adriatic, where the ship that carried it had been sunk some hundreds of years. Perkins' steam gun was an old invention revived by Leonardo da Vinci, and by him attributed to Archimedes.

Steam locomotion by sea and land had always been a dream of scientists. As early as 1543 Blasco de Garay tried to accomplish it in the harbor of Barcelona. Denis Papin made a similar attempt at Cassel in 1707. But it was not till the problem of the steam engine had been solved by Watt that the idea of steam locomotion could be put in practice. Inventors have frequently been unsuccessful by not discovering exactly where they fail, and consequently directing their energies to the wrong points, just as Arkwright would have failed with his spinning machine because he could not get his valves to the required thickness. And after all, nothing was wanted except to chalk them; but he had to part with half his profits for the slight but all important information. Though Denis Papin was unsuccessful in his attempt to effect steam locomotion, to him is due the credit of having first thrown out the idea of atmospheric locomotion; and another Frenchman, Gauthey, in 1782 projected a method of conveying parcels and merchandise similar to the now familiar pneumatic tube.

The reaping machine, even, is an old invention. Barnabe Googe, in a book translated from the German, entitled "The Whole Arte of Husbandrie," published in 1577, speaks of it as a worn out invention—a thing "which was woont to be used in France. The device was a lowe kinde of carre with a couple of wheeles, and the frunt armed with sharp syckles, whiche, forced by the beaste through the corne, did cut down al before it. This tricke might be used in levell and champion countreys, but with us it wolde make but ill favoured woorke."

Even in medical science many of what we consider new methods are only old ones revived. The Romans regularly practiced hydropathy, and established baths wherever they went. The employment of anæsthetics is also a revival. The use of ether as an anæsthetic was known to Albertus Magnus in the thirteenth century, and in his works he gives directions for its preparation. In 1681 Denis Papin published his "Traité des Opérations sans Douleur," showing that he had discovered methods of deadening pain. But anæsthetics were known to the ancients, who had their nepenthe and mandragora, while the Chinese had their mayo, and the Egyptians their hasheesh—both preparations of Cannabis indica, and somewhat similar in effect to chloroform.

Gunpowder was known to the Romans, though they only used it for fireworks; and in one particular we are, as yet, behind, for the secret of the terrible and destructive Greek fire has been lost altogether.

Suspension bridges—comparatively new to us—were known in China for centuries; and the people of the same country used coal gas regularly for lighting purposes long before we did.

These are facts easily ascertainable by slight historical research, but it is possible that they will come as a rude awakening to some who scan them, and who have religiously hugged to themselves the belief that they live in the most wonderful age that has yet dawned on civilization.

"To-day" certainly is better and more comfortable than the "good old times," but it is only a question of progress. It is probable that man's powers have a limit beyond which they cannot go, and a common basis from which in all times they have sprung. The man of to-day is not cleverer than his ancestors, but he has the benefit of the experience of mankind in the past centuries, and he starts from school or college with all that they possessed at his fingers' ends, and ever ready for reference in the nearest library, in so far as history is complete.—*A. F., in The Graphic.*

Positive and Negative Electricity.

Dr. Wachter, of Vienna, has recently communicated to the Academy of Science in that city a paper in which he attempts to prove that, contrary to the generally accepted belief, crediting positive and negative electricity with absolutely analogous properties differing only in sign, there are between them many points of diversity. He maintains that the properties of the two electricities are totally different, and these differences manifest themselves in regard to (1) equipotential surfaces, (2) direction of movement, (3) magnetic, (4) thermic, and (5) optic properties; also (6) in regard to the substances electrified. Dr. Wachter treats only of the first and second headings. He asserts that in conductors of great specific resistance the point where the potential has a mean value lies, not midway between the extreme ends of the conductor, but somewhat nearer the negative end. If equal quantities of positive and negative electricity accumulate respectively on two conductors of equal size, the potential, measured by means of an electrometer, has a greater value, irrespective of the sign, on the positive than on the negative conductor. The electric mill revolves in the direction of the flow of positive electricity, which proves that the movement of the molecules of air around a positive and negative point is different. The appearance of the discharge from such points is also different, indicating an inequality in the equipotential surfaces.

To make a good pomade for the hair, take of castor oil 1 pound avoirdupois, pure white wax 4 ounces, melt them together, and then add oil of bergamot 2½ drachms, oil of lavender (English) ½ drachm, essence royale. Stir the mixture while cooling.

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FIREWORKS WITH DRAMATIC ACCESSORIES.

In an inclosure open to the sky, occupying some 400 by 500 feet, near the easterly end of New York's popular sea beach summer resort, there is nightly being presented to the public this summer a pyrotechnical exhibition of a novel character, which our artist has made the subject of illustration on the first page. There is not much that is entirely new in the fireworks shown, although the beauty of some of the combinations of colors is remarkable, and it is evident that the chemical energy developed in their production is always under most skillful guidance; but these, in connection with the theatrical accessories and the scope given for their display in the place where the exhibition is held, combine to make up an entertainment which has attained great popularity, and is generally conceded to be a most delightful treat.

The stage setting, if we may so style it, occupies one entire side of the inclosure, to the depth of about 75 feet, and between this and the audience is a miniature lake, made to do duty as a portion of the river Moskva, there being some boats moving on it and others drawn up at what appear to be the docks and quays of the ancient Russian capital. At either side appear to be arched stone bridges, guarded by fortress-like parapets, suggesting the heavy stone fortifications characteristic of the mediæval ages, and these extend along the water front, but far enough back to give room for the actors. They also form the walls behind which rise the miniature domes, turrets, and cupolas, in Oriental fashion, of that collection of palaces and churches known as the Kremlin, on the terraces of which are sentinels keeping watch. In the distance, almost upon the horizon, and apparently beyond the confines of a walled city of considerable size, is a blue streak, representing the winding course of the Moskva, the whole being an artistic arrangement of stage slides and painted scenes to give one a realistic idea of Moscow as it might have looked on that autumn evening, seventy-four years ago, when awaiting the approach of Napoleon's grand army; while room is allowed between the stage slides for the explosion of fireworks and use of the artificial fires that are to portray the destruction of the city and mimic its falling walls and towers at the time that the noise and glare of the pyrotechnical display is at its height.

To obtain the largest possible amount of enjoyment from an exhibition of this kind, one should, probably, as far as possible, try to forget all of the "machinery" of the business, and be oblivious of the shortcomings of the actors, to thus aid the imagination to call before the mind the real historic event; yet, as all who see it are inclined to ask how the effects are produced, we give, in the smaller views, illustrations, as seen from the rear of the stage, of the hinged and braced scenery, some parts turning on pivots, and all arranged to be quickly thrown down into such semblance of ruin as shall best carry out the idea the piece is intended to represent. One of the small pictures also shows the water serpent and water dolphin, and how they are made, a fountain of fire with a float to sustain it upon the water, and the manner of firing off the grand aerial bouquet of rockets with which the exhibition concludes. About 150 of these rockets are fired simultaneously, the burning of one rocket lighting the fuses of all the others.

The prime materials of the art of pyrotechny have long been well known, but experts, aiming at novel and striking effects, are constantly making new combinations. With gunpowder and its ingredients—niter, sulphur, and charcoal—are used a large number of other substances, such as sugar, starch, resin, camphor, lycopodium, the sulphides of arsenic and antimony, the metals iron, copper, zinc, magnesium, etc. Cast iron and steel are used in powder and small filings; they do not contribute much to the burning power of the pieces, but, when discharged into the air, by their partial oxidation cause brilliant sparks and scintillations, the longer the filings the brighter being the red and white sparks they give. Copper filings give a greenish tint to flame, and those of zinc a fine blue color; the sulphuret of antimony gives a less greenish blue, but with much smoke, while amber, colophony, and common salt give a yellow fire, although the salt must be very dry. Lampblack produces a very red color with gunpowder, and a pink color with niter in excess, serving for making golden showers. Yellow sand or glistening mica gives golden radiations. Camphor yields a very white flame and aromatic fumes; verdigris imparts a pale green; sulphate of copper and salammoniac a palm tree green, and licopodium burns with a rose color and splendid flame. Niter increases the rapidity of the fire, while sulphur retards it, and the charcoal of the powder emits those volumes of sparks which form the golden train of an ascending rocket.

In the exhibition we illustrate are combined some of the best effects of the art of pyrotechny, as shown in the brilliancy and sustained power of the various lights and colors given out by the rockets, wheels, stars, Roman candles, gold and silver rain, serpents, colored fires, etc., and the one or two set pieces generally given at the conclusion. The selection of materials for the effects desired is always governed by the laws of chemistry, as illustrated in every description of combustion, well known laws of mechanics being invoked to turn the forces of chemical combination to the end sought—a work in which no small amount of practical experience and manual dexterity is required to secure the best results.

Of course, it is the forcing of the confined gases, caused by rapid combustion in various formed tubes and other shaped devices, out upon the air that gives the propulsive force of the different pieces, while the definitely measured proportions of the almost numberless ingredients furnish every conceivable hue and the varying degrees of brilliancy; but an enumeration of the many combinations now made by skillful pyrotechnists, and the detail of the means by which they are produced, would go far beyond the scope of the exhibition, the fireworks manufacture forming a special business of considerable importance.*

The "action" of the drama is but brief, and is somewhat set out by various adventitious interludes, a gymnastic exhibition, marching and countermarching of soldiers, music, etc.; but the approach of the French army upon the scene is easily imagined from the increasing noise of bombs, flights of rockets, and readily assumed appearance of consternation of the actors. This is apparently subdued for a brief period as the solemn strains of the Russian national hymn strike the ear, and afterward while a procession of white-robed priests appear at a miniature shrine of a Greek church and render a chorus of some classical music of somber character, which has a most striking effect across the water of the little lake, but which it is safe to say was never heard within the walls of a Greek church in Moscow at the time the audience is supposed to revisit it. Then follows increased alarm at the gates. The guns of the French cannoneers as they draw steadily near, liberally assisted by discharges of giant crackers, thunder with ear-splitting effect against the wooden walls, bombs fly hurtling through the air over the doomed city, the bearskin caps of the French grenadiers appear at the entrances at either side, and steadily as fate itself their columns press upon the retreating and now thoroughly terrorized Russians, who rapidly disappear within the nooks and byways of the city. The prisoners in the jails are liberated from their confinement, and with torches appear to light the fires, amid which are now seen and heard the roar of the flames and the tumbling walls and general destruction of the city, the air being full of burning serpents, and the water alive with incandescent figures to suit every imagination, while the aerial bouquet of rockets is setting evanescent stars of every hue in the heavens above, with the disappearance of which, as a conclusion, we come back to comparative darkness and "the sober realities of every day."

* For details of manufacture and various formulæ for many kinds of colored lights used in stars, rockets, Roman candles, wheels, etc., see SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 49, 139, 209, 217.

Long Distance Telephoning.

The American Telephone and Telegraph Company of New York has recently been organized for the purpose of establishing direct telephonic communication between the large cities of the country. The first line has been constructed between New York and Philadelphia, the length of the route adopted being about 100 miles. Four years ago a similar attempt was made to connect New York and Boston, but the iron wire strung between the two cities did not prove successful. The present company has employed hard-drawn copper wires, and now has seventy-four of them running the whole distance. The line is entirely aerial, except where waters of some width are crossed, in which case submarine cables are employed. Between the two cities there are six series of cables, the longest stretches being under the Hudson and Delaware rivers. The cables terminate at the foot of Vesey Street, in New York, and near the foot of Walnut Street, in Philadelphia. The line will probably be open for business within a few weeks, and it is expected that it will prove a great convenience.

Galen on the Treatment of Obesity.

"The best method of getting thinner consists in gradually withdrawing from the body that whereof there is superfluity, and in strengthening at the same time those parts which had been expanded. Bodily exercise will undoubtedly prove very advantageous, as we see stout horses getting lean by heavy work. Thus, likewise, those will never grow fat who are obliged continually to toil with hard labor. This, however, requires great precaution, it being certain that fat people frequently run danger of death when attempting violent bodily exercise." And Galen says: "Regular alvine motions, energetic bodily exercise, a moderate life, a diet which, although satiating, yields but limited nourishment; which explains why Hippocrates advises stout people wishing to grow thin to dine on vegetables cooked with fat, in order that they may become satiated by a small quantity of food."

Correspondence.

The Polarity of Tadpoles.

To the Editor of the Scientific American:

In your issue of July 3, I notice a short paragraph on "The Polarity of Tadpoles," which states that when a current was passed into the dish containing them (the poles of the battery being immersed in the water), all of them without exception took up "one position, that in which the head was turned to the anode and the tail to the cathode."

I see nothing really surprising in this, and certainly nothing that would prove "polarity" in the tadpole. The "shock" from the cathode is always a great deal stronger than from the anode; also, the head of the tadpole (as in all animals) is the more sensitive portion of the body, electrically; hence the cathode presented to the head, if the current be strong, becomes quite powerful, whereas, if presented to the feet or tail, the current is much less severely felt.

The arrangement of the tadpoles with their tails to the cathode is the position they should assume in order to reduce to a minimum the unpleasant sensation of the passage of the electrical current through their bodies.

Confine a man in such a way that the current from a battery must pass through his body from head to foot, and he would very soon arrange himself with his feet to the cathode and his head to the anode, and yet this would be far from proving "polarity" in the human body. There may be "polarity" existing in the tadpole, but a different experiment than that made by Prof. Herman is necessary to prove it to me.

C. HENRI LEONARD, M.D.

Detroit, Mich., July, 1886.

Cleaning Woolen Fabric.

The *Leipziger Muster-Zeitung fur Faerberei*, which is likely to be good authority on such subjects, expresses its views on cleaning woolens as follows:

Opinions on the best methods of cleaning woolens are so infinitely different, and so various and contradictory are the statements of practical papers on this point, that it appears to me, says the editor, a remunerative and interesting task to examine the matter thoroughly. I tried the various degrees of heat, from the hottest to the coolest temperature, and I employed all the favorite cleaning materials one after the other—soap, borax, ammonia, benzine, and mixtures of these articles. The results were so decided, and so plainly marked, that the following conclusions must be regarded as definitely established:

1. The liquid used for washing must be as hot as possible.

2. For the removal of greasy dirt, sweat, etc., borax is of so little value that its application would be mere waste. Soap lye alone is better, but the preference must be given to soap lye along with ammonia. This mixture works wonders by quickly dissolving dirt from particular parts of underclothing which are hard to cleanse. It raises and revives even bright colors, and is altogether excellent.

3. On the other hand, for cleaning white woolen goods, there is nothing which even approaches borax. Soap lye and borax, applied boiling hot, gives white woolens a looseness and a dazzling whiteness which they often do not possess when new.

4. If shrinking is to be entirely avoided, the drying must be accelerated by repeatedly pressing the woolens between soft cloths. In no case should woolens be let dry in the sun, as in this case they become dry and hard. They are best dried in a moderate current of air, and in cold weather in a warm place, not too near the stove.

For colored goods there should be prepared a lye of seven quarts of soft water and two ounces of the best softsoap, the quantities being, of course, modified according to judgment and the dirtiness of the articles. The soap is dissolved over the fire, and the lye, properly stirred up, is divided into two vessels, to one of which is added a teaspoonful of ammonia for each quart of lye. The woolens must be entered at a heat which the hand cannot bear, and the fabric must, consequently, be turned and pressed with smooth, wooden stirrers. They are then pressed out as far as possible, and transferred to the second lye, containing no ammonia, and which by this time has become so cool that the articles can be pressed by hand, but no twisting or wringing must take place. They are then pressed between three or four soft dry towels, till the latter no longer become wet.

For white woolens there is added, instead of ammonia, a teaspoonful of powdered borax to each quart of soap lye, and the operation is otherwise conducted exactly as above described. If the second lye is too soapy, it may be diluted with a little hot water.

After two or three lots of woolens have thus been washed, the lye must be heated again—the first lot being put aside to settle, the second being made first—with the addition of ammonia or borax, as the case may be, and fresh lye made for the second.

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POLARIZED LIGHT.

SIMPLE INSTRUMENT FOR THE EXAMINATION OF MICROSCOPIC OBJECTS.

BY GEO. M. HOPKINS.

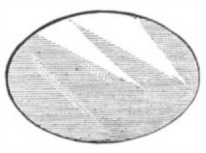
V.

The examination of microscopic crystals by the aid of the polariscope is an exceedingly interesting part of the study of polarized light. The indescribable play of colors, and the variety of exquisite forms of the smaller crystals, render this branch of the subject very fascinating. But to undertake the examination of this class of objects in the usual way, requires a microscope with the addition of a polariscope, which calls for an outlay of at least fifty dollars besides the cost of the objects; and while it is believed that such an outlay would be indirectly if not directly profitable, it is not necessary to expend a fiftieth of that amount to arrive at very satisfactory results.

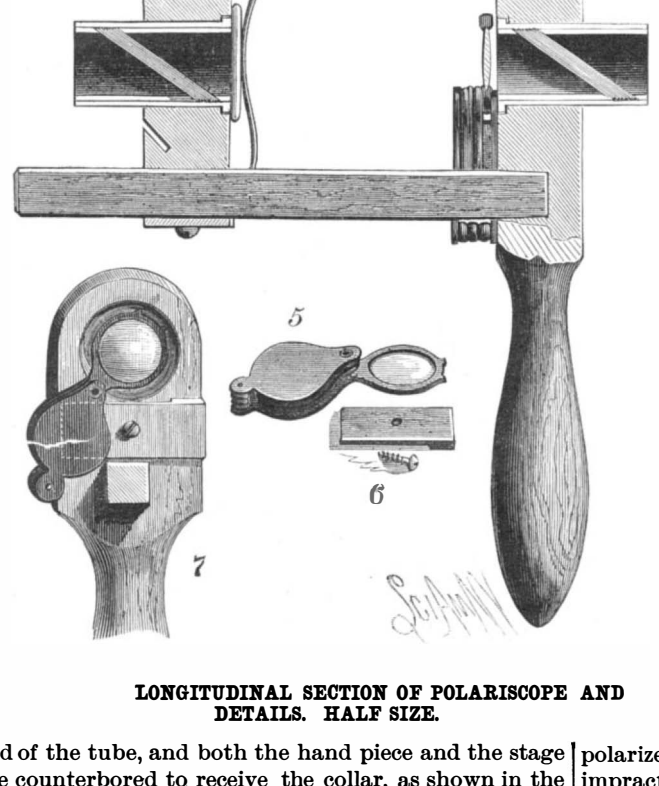
The cost of the compact and efficient little instrument shown in Fig. 1 is as follows: 1 pocket magnifier, having two lenses 1½ in. and 2 in. focus respectively, giving when combined a ¾ in. focus, 50 cents; eighteen elliptical microscope cover glasses for analyzer, 38 cts. The cost of wood for the principal parts, the pasteboard tubes, the glass for the polarizer, and the metal strips for the slide-holding springs can hardly be counted, and the labor must be charged to the account of recreation; so that less than one dollar pays for an instrument that will enable its owner to examine almost the entire range of microscopic polariscope objects with a degree of satisfaction little less than that afforded by the use of the best instruments.

The form, proportions, and material of the body of the instrument are entirely matters of individual taste. In the present case, the hand piece and sliding stage are made of ⅞ in. mahogany, the handle being formed on the hand piece by turning. The stage is 2½ in. square, and has in its lower edge a half inch square transverse groove, which receives the square rod projecting from the hand piece at right angles. The rod is held in the groove by a wooden strip fastened to the lower edge of the stage by two wood screws, so that it bears with a light friction on the under side of the rod.

The hand piece and stage are both pierced above the rod with holes which are axially in line with each other. The diameter of the holes is governed by the size of the cover glasses. Those in the instrument shown are of the exact size and form of the annexed diagram.



These cover glasses are procurable from any dealer in supplies for microscopists. Eighteen of them, at least, are required. The paper tube inclosing these glasses is a little more than 11/16 in. internal diameter; its outside diameter is ⅞ in. and its length is 1¾ in. A narrow paper collar is glued around one end of the tube, and both the hand piece and the stage are counterbored to receive the collar, as shown in the sectional view, Fig. 2. To the tube thus described is fitted an internal paper tube, which is about ⅛ in. shorter than the outer tube. The inner tube is divided diagonally at an angle of 35° 25′, which is the complement of the polarizing angle for glass (54° 35′). The oblique surfaces thus formed, when placed in the tube in opposition to each other, support between them the glass plates at the polarizing angle. The simplest way to arrange the angles of the tubes and other parts of the polariscope is by the employment of a triangle of cardboard like that illustrated in Fig. 8. In fact, a copy of the triangle here shown may be used.



LONGITUDINAL SECTION OF POLARISCOPE AND DETAILS. HALF SIZE.

It is sometimes a matter of considerable difficulty to clean the thin cover glasses without the risk of breaking a large percentage of them. An effective device for holding the glasses while they are being cleaned is shown in Fig. 4. It consists of a piece of thin Bristol-board, having an elliptical aperture loosely fitting the edges of the glass to be cleaned, and a plain card glued to the back of the apertured card, and forming the bottom of the shallow recess into which the glasses are dropped for cleaning. The holder may be pressed down upon the table by the fingers of one hand, while the glass is rubbed with a soft linen handkerchief, after being breathed on. Glasses that cannot be easily and thoroughly cleaned in this way are worthless for this purpose.

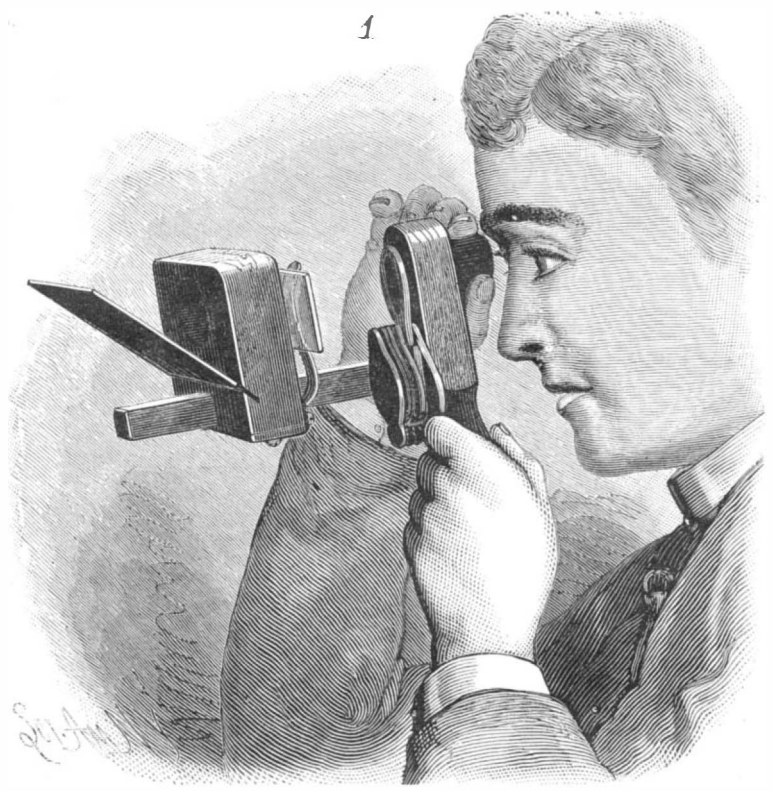
Before the glass plates are put together, they are dusted with a camel's hair brush to remove any adhering lint and dust. The paper tubes are made dead black inside and outside.

The front of the stage is provided with a pair of thin brass springs, which serve to clamp the object slide with a light pressure to the stage. In the back of the stage, below the central aperture, is formed a groove for receiving the black glass polarizing plate. The groove supports the black glass at an angle of 54° 35′ with the plane of the stage, or at an angle of 35° 25′ with the holes in the stage and hand piece. The polarizing plate may consist of a plate of polished black glass, but it is generally more convenient to employ an ordinary piece of glass blackened on one side. A thin pine wedge cemented to the back of the plate causes it to bind in the groove of the stage.

To the inner face of the hand piece is clamped an ordinary pocket magnifier, shown in Fig. 5, by means of the wooden clip shown in Fig. 6. Fig. 7 shows the arrangement of the magnifier relative to the analyzer. Any magnifier of suitable focus may be pressed into the service. The face of the stage and other parts of the instrument visible through the analyzer are blackened.

The object to be viewed is placed on the stage and focused, when the instrument is held so that the black glass polarizing plate reflects the light through the object and through the analyzer. The analyzer is then turned, and the object observed. To heighten the color effects, a plate of selenite or mica may be placed immediately behind the object, or between the stage and black glass plate. Mica plates of suitable thickness are selected by trial in the instrument, and preserved for future use.

It is sometimes desirable to rotate the polarizer. When the black glass plate is used, this is impracticable, but by removing this plate, and inserting in the stage a polarizer consisting of a tube containing plates like the analyzer, the effects of rotating the polarizer may be observed. To render the rotation of the paper tubes smooth and uniform, their bearings in the hand piece and stage are rubbed over with the point of a soft lead pencil, imparting to them a thin coating of plumbago, which diminishes friction and prevents sticking. The objects which may be examined by the aid of this instrument are very numerous. Many of them are easily prepared, and some need no preparation at all. The chemical salts mentioned below may be prepared for observation by allowing their solutions to evaporate on a slip of glass: Alum, bichromate of potash, bichloride of mercury, boracic acid, carbonate of potash, carbonate of soda, citric acid, chlorate of potash, hyposulphite of soda, iodide of potassium, nitrate of ammonia, nitrate of copper, nitrate of soda, oxalic acid, prussiate of potash (red), prussiate of potash (yellow), sugar, sulphate of copper, sulphate of iron, sulphate of nickel, sulphate of potash, sulphate of soda, sulphate of zinc, tartaric acid.



POLARISCOPE FOR MICROSCOPIC OBJECTS.

Slips of glass, 1 × 3 inches, are convenient for this purpose. A circle about ¾ inch diameter is formed on each slip with a piece of paraffin or wax, and while the slips are supported in a level position, a few drops of a rather strong solution are placed in each circle, and the slips are allowed to remain quietly until the crystals form.

For methods of covering and preserving these crystals, as well as for hints on the preparation of the more difficult crystals, the reader is referred to the works on microscopy, as these matters are without the province of this article.

The following vegetable and animal substances may be shown by polarized light:

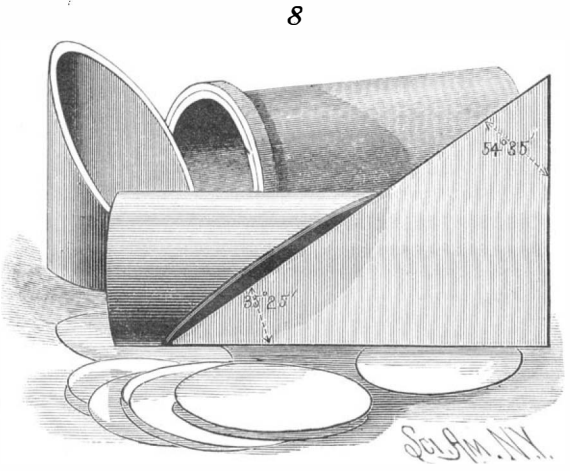
Cuticles, hairs, scales from leaves, fibers of cotton and flax, starch grains, thin longitudinal sections of wood, oiled; spicules of sponges and gorgoneæ, cuttlefish bone, hairs, quills, horn, finger nail, and skin. These objects should be thin and translucent or transparent. It is necessary in some cases to increase their transparency by soaking them in oil or some other suitable liquid.

Many rock sections and sections of minerals may be studied advantageously by the aid of polarized light, but since the objects are quite difficult to prepare, no list of them is given.

It is perhaps well to suggest that the polarizer and analyzer shown in Fig. 2 may be readily adapted to a microscope, placing the polarizer below the stage and the analyzer in the draw tubes.

DEAFNESS appears to be exceptionally prevalent in Kennebec County, Maine, and in Martha's Vineyard.

HOLDER FOR GLASS.



TRIANGLE AND PAPER TUBE. FULL SIZE.

A recent scientific investigation of the matter shows that in both districts there is abundant evidence of heredity, and especially of atavism. In the families affected there were also found blindness, insanity, idiocy, and deformity, and in some cases a long history of consanguineal marriages. In Martha's Vineyard the distribution of deafness coincides with that of certain soils, and its eastern boundary is also the typhoid fever line.

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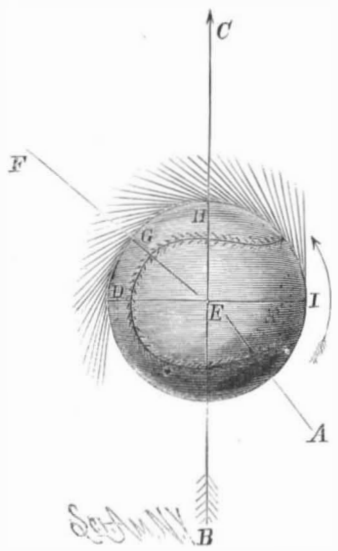
THE ART OF PITCHING IN BASEBALL.

BY HENRY CHADWICK.

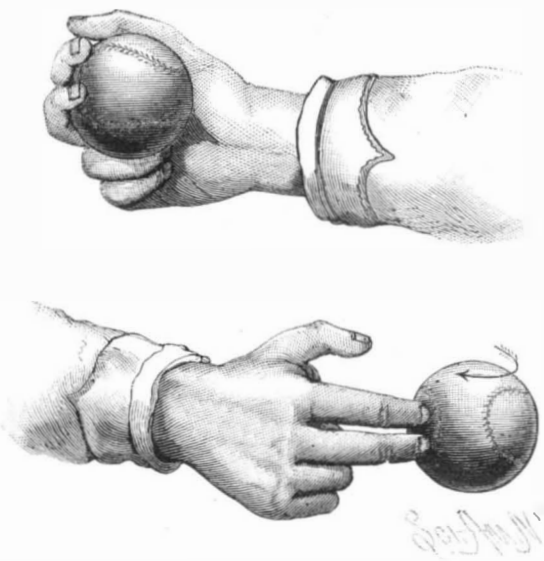
In these days of remarkable exhibitions of skill in playing baseball by professional exemplars of the game, one cannot look back to the early period in the history of baseball without being struck with the great contrast between the work done on the diamond fields at Hoboken, in the "fifties," and that which marks the play of the leading professional teams of the present era. The game has been wonderfully improved since its boyhood days, and in nothing so much as in the great degree of skill now shown in the pitching department. In fact, the pitching of the present day is marked by an amount of skill, dexterity, and the accurate performance of the work experience has taught, which Webster defines as characteristic of an art. Without writing an essay on the subject, I will merely refer to what this art consists of in its application to the pitching of the period. In the first place, modern pitching excels the old method of delivering the ball to the bat in one special feature, and that is in *the horizontal curve of the ball through the air*, something practically unknown in the days of old on the historic Elysian Fields at Hoboken. It is in this one respect, in fact, that its advance has been so noteworthy; for in some other essentials of success in pitching, the veterans of the old school were not so far behind the work of the present day, for they were skillful strategists in the position. But the old pitchers of the period in question literally *pitched* the ball to the bat, they not being allowed the advantage of throwing the ball as our modern pitchers are, the term "pitcher," as applied to the occupant of the "box" in our professional teams of to-day, being a misnomer. This curving of the ball in the horizontal line of its delivery from the hand of the pitcher to the catcher behind the batsman is the great feature of the modern art of pitching. It is not many years ago when the curving of the ball in question was regarded as a physical impossibility; and even now some people question its being done. For instance, the editor of the Grand Rapids *World* recently wrote as follows on the subject: "The editor of this paper came near getting roundly abused by a leading lawyer of this city a few days ago, because he ventured to dispute the correctness of the 'curved ball' theory from a scientific standpoint. The baseball enthusiasts claim for Getzein that he is able to so pitch a ball that it will describe the arc of a circle on a horizontal plane before reaching the catcher, and that therein lies the secret of his marvelous pitching, which has done so much to secure victory to the Detroit Club. Scientifically, this theory is utterly absurd. The forces that act upon a ball pitched by Getzein are not different from those which operate upon a projectile thrown from any other source, and the results must be the same, and governed by the same laws. The curves are in the imagination of Getzein's admirers. When the ball leaves his hand it is beyond his control, and it moves forward from the impulse last given it as it leaves his hand. It is then controlled by the force of propulsion, the resistance of the atmosphere, and gravitation. The tendency of the first is to urge it forward in a straight line, and it so moves until the force of gravitation becomes greater than the force of propulsion, and then it begins to descend. The resistance of the air simply retards its motion or may change its direction; but this change of direction is entirely beyond the pitcher's control ordinarily. Getzein's antic and deceptive motions may deceive the batter, so that he is unable to discover the exact course of the ball in time to strike it, but he cannot throw a ball so as to make a curve on a horizontal plane. We are willing to rest the decision of the case with the editor of the SCIENTIFIC AMERICAN, and abide by his decision."



CUT A.—DIAGRAM OF THE ROTARY MOTION OF THE BALL ON ITS OWN AXIS.

Unfortunately for the statement made by the *World* editor, viz., that "scientifically the theory is absurd," the theory in question is as simple in its rules as it is easy of demonstration practically. It is as follows: The ball, in its horizontal flight through the air from the hand of the thrower—technically known as the pitcher—is retarded in its forward motion by the resistance of the air, which not only exerts a pressure on the face of the ball, but also a resisting force on its sides by friction. Now, if the ball is simply thrown forward without any special bias being given it, the friction of the air is equal on each side of it; but if it be made to rotate on its own axis from right to left or left to right, the conditions are at once materially changed, inasmuch as in the latter case one side of the ball's surface is made to move forward through the air with twice the rapidity of the other side, and to the extent of this increased lateral friction is the ball retarded in its progress on the side on which the increased friction bears. The result of this changed relation is naturally a curve in the line of its delivery in the direction of the side on which its progress has been retarded. This is the simple philosophy of the curve of modern baseball pitching. The application of the theory in practice is to learn to give the necessary bias or rotary motion to the right or left—in order to produce the "in curve" or the "out curve." For instance, the appended diagrams illustrate the lines of direction of a curved ball, the straight arrow (Cut A) indicating the forward direction of the ball, and the bent arrow that of the rotary movement of the ball on its own axis. The bias to the right or the left is imparted by a quick motion of the wrist, the ball being clasped by the fingers in such a way as to give it the required twist.

If the ball (or strictly its center of gravity) is moving forward (let us say at the rate of 100 feet per second), and at the same time it is revolving so that points on its equator are traveling around its center at an equal rate, it is evident that D is traveling *backward* as fast as the ball, as a whole, moves forward; while I is moving forward at its own rate *plus* that of the center—that is, twice as fast as E. As the friction of the air increases with the velocity of the moving object, it must be greatest at I and least at D, being really zero at D under the conditions given. The I side of the ball is therefore retarded more than the center or any other part, while the D side suffers no retardation. The result must be a curve toward the retarded side. When the rotation is on a nearly vertical axis, this effect will be at its maximum, and, according to the direction of its "twist," the ball will curve to the right or to the left—"*in*" or "*out*."

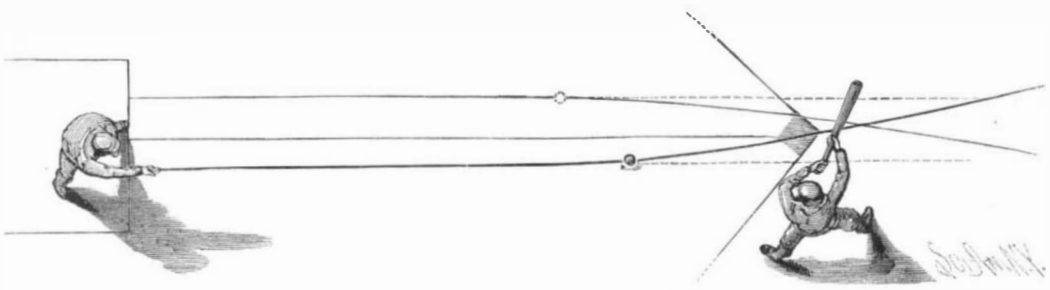


CUT B.—DIAGRAM OF THE METHOD OF GRASPING THE BALL IN DELIVERY.

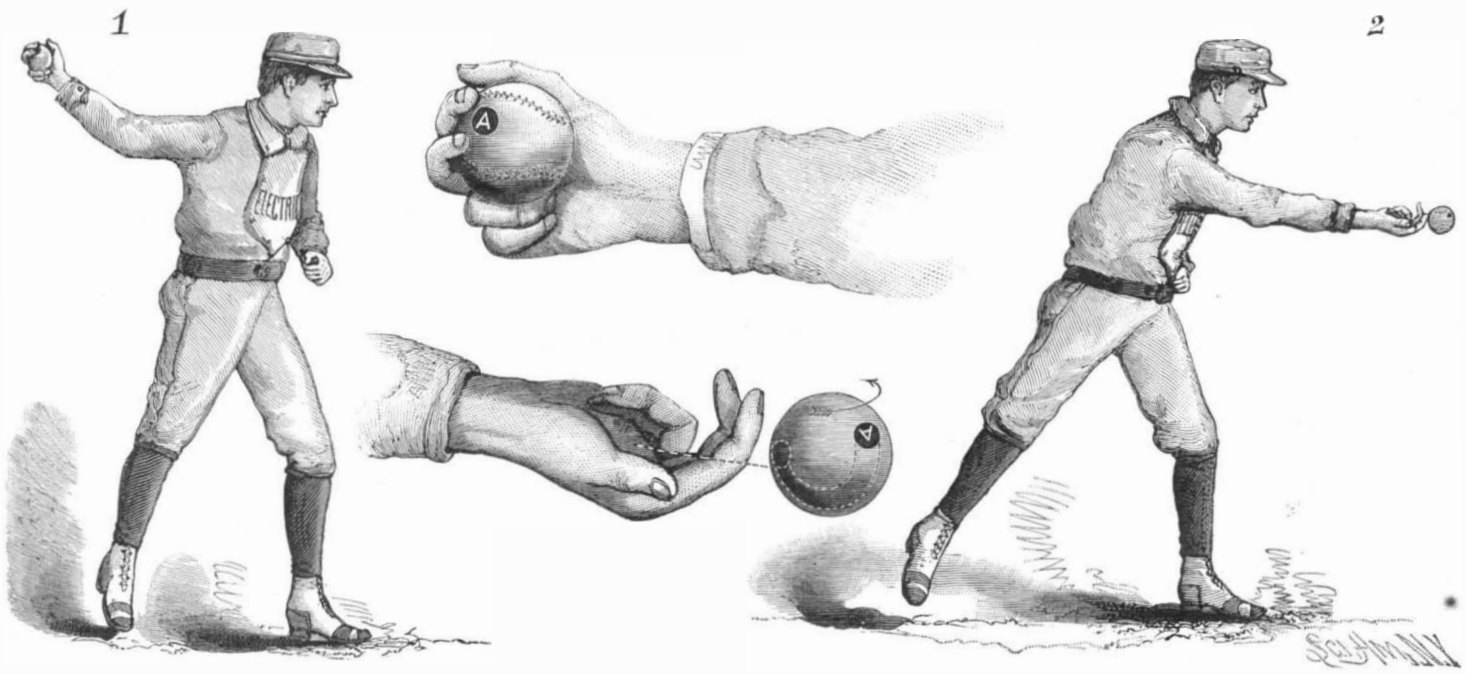
It is almost impossible to fully illustrate the action of the wrist and fingers in imparting the bias to the ball which produces the curves in question, but a curve pitcher gives me the appended illustration of his method of holding the ball when he first takes his position to throw, and when the ball leaves his hand.

He says that in order to produce the out curve, you secure the ball in the hand by pressing it firmly between the first two fingers and the thumb, with the third and little fingers closed in the palm of the hand. In delivering the ball to the batsman, throw the arm forward midway between the shoulder and waist, and at the moment of releasing the ball turn or twist the hand quickly to the left.

The cuts above show how the ball is held just before its delivery, and also its position as it leaves the hand. (Cut B.) In producing the in curve, the pitcher should grasp the ball securely with all the fingers, and with the thumb pressed firmly against the opposite side. Throw the ball at a height equal to the



CUT D.—DIAGRAM OF THE LINES OF IN CURVE AND OUT CURVE BALLS.



CUT C.—DIAGRAM OF THE METHOD OF GIVING THE ROTARY MOTION TO THE BALL.

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shoulder, and at the instant of releasing it from the hand twist quickly outward, allowing the ball to twist off the ends of the first two fingers.

These movements are still further shown in the preceding cuts, the ball marked with the black spot and letter A, held in the hand, and the same as it leaves the hand, showing how the ball is made to rotate on its own axis while it is being thrown forward; while the figures standing—Nos. 1 and 2—show the movement of the arm in throwing. (Cut C.)

The accompanying diagram illustrates the lines of the two curves, one of which is developed nearer the home plate than the other. The dotted lines show the direction the ball would take but for the rotary motion imparted to the right or the left, and it will be seen that in both instances but for the curving of the ball it would have passed clear of the base, but the curves take it over the base. (Cut D.)

There are other important essentials of success in the art of pitching outside of the power to curve the ball to the right or the left, and the first of these is thorough control of the ball in delivery, without which strategic skill in pitching is next to impossible; besides which, even the curving of the ball is robbed of its advantages. Of what use is the power to curve the ball in sending it to the batsman unless you can control its direction so as to make it pass over the home plate, and at the height called for by the batsman, at will? Speed in delivery is another essential which is comparatively useless as an element of success unless accompanied by thorough command of the ball. But suppose you possess these essentials of the "curve" and of speed in delivery, in combination with the required command of the ball, so as to secure accuracy of aim in your pitching, you will still be wanting in a thorough knowledge of the "art of pitching" unless you can bring skillful strategy into play in your work in the "box," technically termed "headwork."

It may be naturally be asked, "What is strategy, or 'headwork,' in pitching?" and its elements may be summed up as follows: Primarily, it is to deceive the eye and the judgment of the batsman who faces you as to the character of the ball sent in to the bat; such as making it appear that you are sending in a very swift ball, when, in fact, the pace of the ball is lessened by a well disguised method of delivery. Also to suddenly change the line of the ball's direction through the medium of the "curve" after sending in a straight ball. To these strategic points are to be added that of watching the action of the batsman, so as to catch him standing out of good "form" for effective batting; and lastly, to tempt him to hit a high ball to a part of the field where you have a fielder ready to catch it. These are the main characteristics of strategy in pitching, and together with the "curve" and speed and command of the ball, they comprise the essentials of the art.*

A Field for Inventors.

The *Fireman's Journal* copies from the *Chronicle* the following statistics relative to fire losses, and suggests that the field for the invention of devices for reducing the losses by fires originating from several common causes is a vast one, and thinks no class of persons are more familiar with the dangers to be guarded against, or better qualified to do some useful and profitable thinking on this subject, than fire insurance agents. Accordingly, in the hope that some of our readers, adds the editor of the *Journal*, may make themselves millionaires in this manner, we will proceed to recite a few specifications.

For every dollar of loss on the premises where a fire originates, eighty cents of damage is inflicted through exposure upon contiguous property. Much the larger part of this loss is from external exposure. Wanted, a method to prevent buildings from taking fire from the outside.

Friction in machinery caused the destruction of $1,000,000 worth of property in the United States last year. Wanted, a method of lubrication which will do away with inflammable oils.

Matches carelessly handled burned over $500,000 worth of property in the United States last year. Wanted, a substitute for matches, or a safety match that is as good as its name.

Defective flues burned about $2,750,000 worth of property. Wanted, a flue that cannot be defectively constructed.

Defective heating apparatus burned nearly $500,000 worth of property. Wanted, heating apparatus that cannot prove defective.

Electric wires and lights, a source of increasing danger, burned over $250,000 worth of property. Wanted, a system of insulation that cannot prove faulty.

Explosions of kerosene lamps burned over $1,500,000 worth of property. Wanted, lamps and lanterns that cannot explode.

Lightning burned $1,250,000 worth of property. Wanted, a perfect lightning rod.

* The SCIENTIFIC AMERICAN SUPPLEMENT Nos. 402 and 410 contains illustrated articles on the science of baseball playing. These articles were highly commended by expert players at the time they were published, but the skill of the game has considerably advanced since then. All interested in baseball, however, will be interested in these papers.

Sparks from locomotives and other sources burned $2,000,000 worth of property. Wanted, a spark arrester of genuine merit, or stoves and furnaces in which combustion is more nearly perfect.

Gas jets burned $1,250,000 worth of property. Wanted, a device for preventing the contact of goods and curtains with open gas burners.

These are a few of the most necessary inventions. But others are needed also. For example, there is a demand for a cigar that will extinguish itself before it is thrown away, also a plan for paralyzing incendiaries as soon as they decide to wield the torch. Another required invention is an automatic contrivance to pillory tramps before they enter barns and granaries. Still one more device, perhaps the most necessary of all, should not be forgotten, namely, a device for inoculating careless property owners with the spirit of carefulness, or of trepanning their skulls with the sense of watchfulness.

The Wonderful Things Produced from Our Bituminous Coal.

Few persons have any idea of the wonderful products from a lump of coal—a lump of coal that is placed in the retort of a gas manufactory. Ordinarily burned, the combustion of a lump of coal results in carbonic acid smoke (which is merely soot, or rather the visible portion of smoke is soot), and the ash, in which are found silica, alumina, oxide of iron, phosphoric acid, sulphuric acid, potash, sodium, combined sulphur, sometimes traces of chlorine, titanic acid, and other substances. In the gas retort a variety of products are obtained. The gas as it is carried through the hydraulic main to the purifying rooms takes with it tar and ammonia, the latter evolved from the nitrogen. The ammonia has to be washed out with water in an arrangement by which the ammonia is gathered and saved. Tons and tons of sulphate of ammonia are thus made, and become an article of commerce. The sulphur is removed by caustic lime or oxide of iron. The carbonic acid is also removed by lime, but the sulphurous acid cannot be removed, and, with several others, remains in the gas after all efforts to remove it. The others give the gas its smell.

By distillation, naphtha and asphaltum are obtained. Asphaltum is a dead oil, very useful to preserve wood. From this, too, carbolic acid is obtained, very important in surgical operations as being the most valuable antiseptic known. From naphtha, benzole, eumol, toluol, and cymol are obtained. Naphtha, as is well known, is used as a burning fluid. Benzol is a solvent for grease and oils, very useful in cleaning kid gloves and things of that kind.

Benzole treated with nitric acid produces nitrobenzole. This, singularly enough, is used as a flavoring extract by confectioners and for perfuming soap. When used for this purpose, it is known in commerce as the essence of myrrhbane, which it is not, although it smells and tastes something like essence of myrrhbane or oil of bitter almonds. Nitrobenzole is terribly poisonous, but not more so than some other adulterants used by confectioners.

From nitrobenzole, aniline is obtained. This when first obtained is a perfectly colorless liquid, but darkens as it grows older. From aniline are obtained the coal tar colors, which are so very brilliant. The colors are of all hues. The one known as "Turkey red" is exactly similar to the red that used to be made from the madder root. Since the discovery of this aniline, it has almost completely broken up the raising of madder in Holland. There thousands of acres were devoted to the raising of madder root to get the Turkey red dye. It can be made much cheaper from the product of a gas factory.—*The Coal Trade Journal.*

Tinkers and Their Tricks.

Steam users would undoubtedly have less expense for fuel, and smaller machine shop bills, if their engines were left as they came from the hands of the workers. Unfortunately, some engineers have an itching to alter things, and feel that the only way to show their knowledge of the business is to screw and unscrew, reset valves, and make changes which are prompted by nothing but sheer nonsense; notions, in short, derived from gossip with others. This is particularly true of automatic engines; and when the tinker by trade gets hold of one of these, there is no telling where he will stop. If an engine pounds, from whatever cause, the first thing to do, in the minds of some, is to change the valves; and when the screw wrench is applied to the side rods, eccentric rod, and eccentric itself alternately, or by mere caprice, the adjustment gets into such a condition that it is a wonder the engine runs at all.

Indicator cards, current in various works, on the instrument show the wonderful alterations which can be produced by a man with a screw wrench; and we have seriously felt that the only way to prevent this meddlesome alteration would be to key the eccentric fast, so it couldn't be moved readily, and to press the rocker arms in the valve stems so that they couldn't be budged either. Then, if the side rods from the wrist plate to rocker arm were in one piece, the tinker's occupation would be gone, and the engine would give much better satisfaction. Side rods could be easily made without adjustment, simply by having a pair of adjustable rods for shop use, setting the valves by them, finding the centers, and welding the rods which belong to the engine, so that they have no adjustment. That would settle it so far as tinkering with the valve gear is concerned.

Our remarks upon this head bear wholly upon those who, being put in charge of an engine which is performing properly, do not hesitate to change it, as they fancy, for the better, simply by guessing. There is only one way to remedy defects in engines, and that is, so far as the distribution of steam is concerned, to indicate it. No guessing is needed then, for the remedy is in plain sight. In cases of extreme derangement, however, the man with the screw wrench cannot do a great deal of harm if he is fit to be about an engine at all. Of course he can screw up and key up until he has everything blue hot, but he is not apt to do it regularly. Engines by standard makers leave the shops in good order, fit for work, but they lose their efficiency oftener through the mistaken zeal of those in charge rather than through hard work. The tinker can do more mischief in an hour with a screw wrench, as regards loss of efficiency, than the engine itself would lose in a year's time.—*Milling Engineer.*

Floating Iron Moles.

Sakhansky, a Russian engineer, who designed, a short time ago, a floating port for the 9 ft. shallows at the mouth of the Volga, has been delivering a lecture at St. Petersburg on his system in general. Objecting to stone moles on the ground of their cost and the constant dredging they require, owing to the silting of the harbors inside them, he advocates the adoption of submarine iron pontoons, chained to the ground in such a manner as to allow a circulation of water above and below them. The pontoons proposed are 10 yards long, and would be first sunk over the spot selected for the mole, and then allowed to rise to the required height by pumping a certain quantity of water out of them. The force of the waves breaking over the top would repress the tendency of the pontoons to rise, and keep them in proper position, while the circulation of the water below would prevent silting.

Trades and Professions in France.

The following interesting figures are taken from the *Revue Industrielle:* Half the population of France lives upon agriculture, one-quarter lives by various manufacturing industries, one-tenth by commerce, four-hundredths by the liberal professions, and finally six-hundredths are "rentiers" of various kinds. Among the agriculturists, there are 9,176,000 who are proprietors farming their own land. The others are tenant farmers under various system of holding, laborers, or very small holders who also work for others. The large industries, such as mines, quarries, and the more important manufactories and workshops, occupy 1,130,000 persons, while the lesser industries occupy 6,093,000. Under commerce are comprised 789,000 bankers, brokers, and wholesale merchants, 1,895,000 retail dealers or shopkeepers, and 1,164,000 hotel keepers and what we should class as licensed victualers. The railways and various carrying trades on land and the merchant marine occupy 800,000 persons. Various government and communal employes number 806,000.

Diffusion of Gases.

In illustration of the diffusion of gases, Mr. W. Anderson recently gave some good examples through porous media of inconceivable fineness. When two gases, such as hydrogen and air, are separated by a porous medium, they immediately begin to pass into each other, and the lighter gas passes through more quickly than the heavier. He showed a glass tube, the upper end of which was closed by a thin slice of cork, the lower end dipped into a basin of water. The tube was filled with hydrogen, which is about 14½ times lighter than air; consequently, it left the tube through the cork more quickly than the air could enter in by the same means, and the result was a partial vacuum in the tube, and a column of water drawn up, proving that the cells of cork are eminently pervious to gases. The pores in the cell walls appear, however, to be too minute to permit the passage of liquids.

The Meteorite of May 10.

Mr. H. V. Noszky, of Rosetta, Florida, informs us that at 7:40 P.M., May 10, he observed a fine large meteorite falling toward the southern horizon. This was the same hour at which observers in Havana and other parts of Cuba were startled by the appearance of an immense meteorite passing across the zenith from the northwest to the southeast. From the path of the wanderer, and the close agreement in the time of its passage, there can be but little doubt that it was visible in both countries. Mr. Von Noszky, however, appears to be the only observer who has recorded its appearance in the United States.

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PHOTOGRAPHIC NOTES.

Formula for Working Bromide Paper.—At a demonstration given by Mr. David Cooper before the St. Louis Photographers' Convention, recently, the latest formula for working bromide paper was stated as follows:

Development is accomplished in an exceedingly simple and cleanly manner. The well known oxalate of iron developer, in a slightly modified form, is the most suitable for all purposes.

No. 1.

Oxalate of potash	1 pound.
Hot water	3 pints.

Acidify with sulphuric or citric acid. Test with litmus paper.

No. 2.

Protosulphate of iron	1 pound.
Hot water	1 quart.
Sulphuric acid (or citric acid, ¼ oz.)	½ drachm.

No. 3.

Bromide potassium	1 ounce.
Water	1 quart.

These solutions keep separately, but must be mixed only for immediate use.

To Develop.—Take in a suitable tray: No. 1, 6 oz.; No. 2, 1 oz.; No. 3, ½ dr.

Mix in the order given; use cold. After exposure, soak the paper in water until limp; then immerse in the developer.

The image should appear slowly, and should develop up *strong*, *clear*, and *brilliant*. When the shadows are sufficiently black, pour off the developer and flood the print with the

CLEARING SOLUTION.

Acetic acid	1 drachm.
Water	1 quart.

Do not wash the print after pouring off the developer and applying the clearing solution.

Use a sufficient quantity to flow over the print, say 2 ounces for an 8×10. Allow it to act for one minute, and then pour it off and apply a fresh portion; repeat the operation a third time; then rinse in pure water and immerse for ten minutes in the

FIXING BATH.

Hyposulphite of soda	3 ounces.
Water	1 pint.

After fixing, wash thoroughly two hours, and hang up to dry. Use fresh developer for each batch of prints. With a glass bottomed tray, 7 ounces of developer are sufficient for a 25×30 print.

Object of Clearing Solution.—The object of the clearing solution is to prevent the precipitation of the iron from the developer in the fiber of the paper. This can only be done by keeping the paper acid while washing out the developer.

Citric Acid may be used instead of acetic in the clearing solution, in which case use one-eighth ounce to the quart of water. Citric acid is less liable to cause blisters.

Blisters sometimes appear in bromide paper, and may be avoided by using a little common salt in the first washing water after mixing. The hypo must not be stronger than 3 ounces to the pint of water.

No Toning Required.—With Eastman's permanent bromide paper, the final tones are obtained entirely by development, and range from a soft gray to a rich velvety black, depending somewhat upon the density of the negative and the quality of the light used in printing.

Clean Dishes, Clean Hands.—The faintest trace of hyposulphite of soda or of pyrogallic acid is fatal to good results with bromide paper, and the operator cannot be too careful to avoid any contamination. The tray used for developing with oxalate should never be used for anything else.

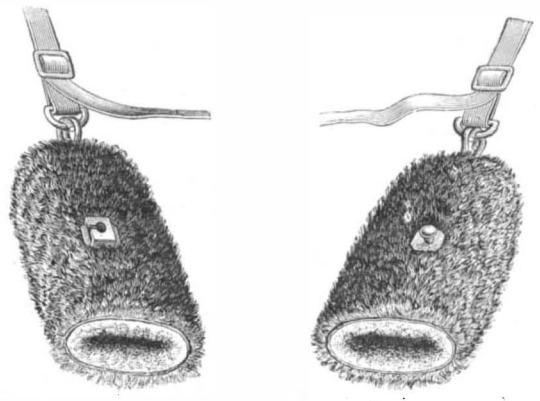
Mention has been made in these directions regarding the use of a dilute solution of acetic acid and water immediately after development, and before washing with water at all. This is a most important point, and cannot be too strongly impressed on the mind. A brief hint as to the reason for using the acidulated water is shown in the foregoing directions, but it is so important that it deserves further consideration. Pure whites cannot possibly be *obtained* and *retained* where this precaution is neglected. As noticed in the directions, it had been proved that thorough removal of the oxalate of iron can only be accomplished while the print and water are kept acid. It seems that the degree of acidity needs only to be very slight, as the formula shows. This has been commented on, and several who doubt the efficacy of the homeopathic dose prescribed have increased the proportion, but have not found any additional advantage. While in cold weather a moderate increase of the acid may not have any serious influence, it may in hot weather develop a tendency to blistering, and should be avoided.

In any case, it is not so much the amount of acid as the repeated application of the very dilute solution recommended which will fulfill the demands.

After fixing, another important measure is the use of a first washing water containing common salt, say half a pound to two gallons of water. This will most effectually prevent blistering, unless provoked by some unusually careless manipulation.—*Photo. Times.*

DRIVING APPARATUS.

The muff or hand protector herewith illustrated completely protects the hands of the driver from cold, while it enables him to hold the reins securely. The muff is made of thick and warm material, and is of such a size as to cover the sleeve of the wearer and protect the wrist from cold. The rein may be attached to the outer end of a stirrup form of holder or loop, arranged within the protector, where it is grasped by the hand. By means of a catch the two protectors may be held together, thereby allowing the driver, if necessary, to withdraw one of his hands,



LOWTHER'S DRIVING APPARATUS.

both reins being then controlled by the hand inserted in one muff.

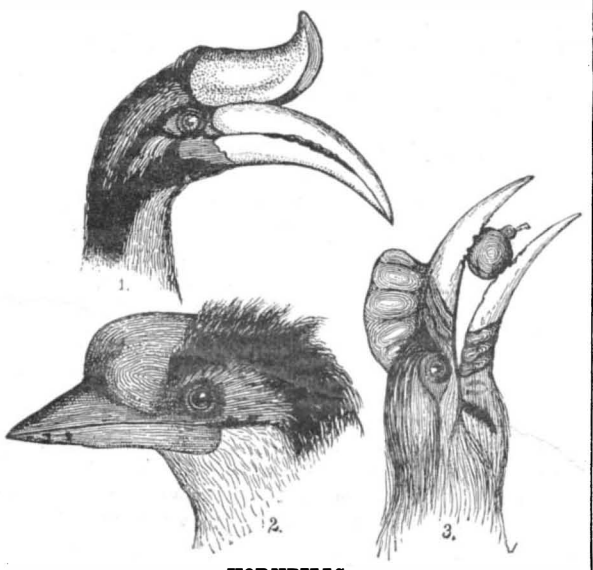
This invention has been patented by Mr. Charles Lowther, of 104 West 11th Street, New York city.

HORNBILLS.

Living specimens of these peculiar birds are rarely, if ever, seen in our zoological collections. There are about fifty species of hornbills known to naturalists, inhabiting tropical Asia and Africa and the islands of the Indian Ocean.

The curious characteristics of these birds which most attract the attention are the enormous development, and the singular horns or protuberances of the beak. In one species the bill armor resembles somewhat the great recurved horn of the rhinoceros, in another a broad, two-sided helmet, while in others it stands up comb-like, in irregular swollen ridges.

In all species it has the appearance of being heavy and solid, but, on the contrary, it has near the skull a core hollowed into numerous cells of various sizes and forms, with very thin partitions between them, while the anterior portion is scarcely more than a hollow shell, so that remarkable lightness is obtained. Indeed, in one species at least, the helmet-like ornament is so delicate in the anterior portion that it may be crushed in with the fingers. The bill is long, curved, and acute, and is often unevenly toothed on its cutting margin, as if small pieces had from time to time been accidentally broken out. The bill is extremely light for its size, the entire core consisting of porous bone. Another peculiarity is that the upper and lower mandibles in some species rarely meet except at the base and tip, the intermediate portion being separated by an open space, sometimes one-quarter of an inch wide.



HORNBILLS.

In the great hornbill (*Buceros galeatus*), Fig. 2, however, the bill is nearly straight, more solid, and there is little or no space between the upper and lower mandible when the beak is closed. The horn also differs greatly from that of the other species. Mr. Forbes says, in parts of Sumatra, "each head commands a large price, for out of its dense white ivory-like consolidated horn are manufactured studs and sleeve links of great beauty."

The hornbills are rather large birds, varying in size from a small crow to a turkey. The plumage is generally dark colored or black, or black and white combined; in some cases the head and neck are red, as in the helmet hornbill (*Buceros cassidix*), Fig. 3. The bill and its horn are most beautifully colored with crimson, orange yellow, and ivory white; especially so in the rhinoceros hornbill (*B. rhinoceros*), Fig. 1, in which species the bill attains great size and beauty. It was this species that some old voyagers declared was the happy possessor of two heads. It is a large bird, measuring over four feet in length.

The hornbills are generally seen in flocks of from ten to twenty; some of the larger species, however, mostly go in pairs. Their food consists for the most part of fruit, while some devour reptiles, insects, eggs, and young birds. The statements of the older naturalists that they were largely carrion eaters, like the vultures, have not been confirmed by modern travelers.

The tongue of these birds is quite small, almost rudimentary, so that in swallowing they are obliged to throw the head back and up, and by a few jerks force the food down into the throat (see Fig. 3). The feet are also peculiar, the three front toes being more or less united for quite a distance from the base, so that they are unable to spread them out, as is the case with most birds. They very much resemble the feet of our kingfisher.

The voice of many species of these birds is said to be harsh and disagreeable. A traveler says when a bird is wounded or captured alive, the terrible noise it makes is perhaps not surpassed in the animal world. It is something between the bray of an ass and the shriek of a locomotive, and is kept up continuously, so as to be absolutely unbearable. When a female bird was captured on the nest, its shrieking was heard nearly a mile off—a horrible noise even at that distance.

The majority of these birds nest in hollow trees. The larger species lay two white eggs, while some of the smaller species are said to produce more. A singular fact connected with the breeding habits of some of the hornbills, which was at first considered fabulous, but now confirmed by various travelers, is, that as soon as the female has laid her eggs in a cavity of a hollow tree, the male completely shuts her in by plastering up the entrance with clay, leaving only a small opening or hole, through which she can protrude only a small portion of her bill, so that she can receive food, with which he keeps her well supplied. She is thus kept a prisoner until the young are hatched, and sometimes longer. A species inhabiting Java the natives call the "jealous bird." They say that if any indications appear of the nest having been visited during the absence of the male bird, he will, on his return, entirely close up the opening with mud, and leave his unhappy mate to starve to death. C. FEW SEISS.

George L. Perkins.

Among the crowd of spectators assembled at New London, recently, to witness the arrival of the yachts of the American Yacht Club fleet was Colonel George L. Perkins, of Norwich, Treasurer of the Norwich and Worcester Railroad Company, a gentleman within a few days of his ninety-eighth birthday, and still hale and vigorous. He saw the first steamboat, Robert Fulton's Clermont, and indeed was a passenger on that vessel some time in 1807, having walked from Norwich to Poughkeepsie to be such, and on Thursday last saw the latest examples of steam engineering in Herreshoff's Henrietta, the Atalanta, etc.

Colonel Perkins has held the office of Treasurer of the Norwich and Worcester Railroad continuously since the incorporation of that company, a period of more than fifty years, and to-day is as prompt in appearing at his desk in the office as ever, and quite as alert in looking after the interests of the concern. He is a tall man, quite erect and even jaunty in his carriage, and does not look his age by twenty-five years. During the war of 1812 he was in the Quartermaster's Department of the United States Army, and from that service derives his title. In his youth Colonel Perkins was considered something of an invalid, and was sent on a voyage to the West Indies under care of a body servant to recover his health. Unlike many men who antedate the railroad, telegraph, etc., the Colonel is quite up to the times, and has no intention of getting left by any of his juniors.

After Treatment of Cataract.

At the St. Louis meeting of the American Medical Association, Dr. Michel advocated the plan of using a light bandage to the eyes after cataract operations and iridectomies, and allowing the patients to be in a lighted room, where freinds can come and read to them. Dr. Michel's plan was not favorably received at St. Louis, but it has been tried by Dr. Chisolm, of Baltimore, who reports fourteen cataracts and four iridectomies treated in this way. After the removal of a cataract or the performance of an iridectomy, the eyes if a cataract, the eye if an iridectomy, is closed in its normal position, and a bit of isinglass plaster, about two and a half inches long by one inch wide, is then rendered flaccid by immersion in some germicide fluid, and is neatly applied to the surface of the closed lids. When dried this forms a close, firm band. The patient is then allowed the full liberty of his room, and is not shut up in darkness, as was formerly deemed essential.

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ENGINEERING INVENTIONS.

A railroad switch has been patented by Mr. Manoah Miles, of Russell, Kansas. Combined with the main and siding rails, switch tongues, and a sliding bar, is a system of levers for operating the latter, arranged outside the track, with sliding locking bolts pivoted to laterally projecting arms of the levers and adapted to be operated in advance of the sliding bar, whereby the switch can be set and shifted automatically by the cars.

An apparatus for cleaning steam pipes has been patented by Messrs. Charles Kynoch and Edgar Courtwright, of St. Ignace, Mich. Combined with a boiler pump and feed water heater is a pipe connecting the boiler with the pipe leading from the tank or well to the feed pump, a three way cock uniting the pipes, whereby dry steam may be passed through the pipes to clean them and blow out all dirt, smut, and sediment.

A car coupling has been patented by Mr. William B. Foster, of Derby, Kan. This invention relates to car couplings in which a bar having hooked ends is used as a coupling bar, this bar being held in position to ride up the inclined face of the drawhead of the opposing car, at such angle as may be necessary, by an arm operated by a shaft extending from side to side of the car, and this arm then locking over the ends of the coupling bar.

A car coupling has been patented by Mr. Joseph T. Hammick, of Rhinebeck, N. Y. The drawbar is in the form of two parallel bars, one above the other, and connected at their forward ends by an oval-shaped drawhead, the coupling pin being stationary, with various novel features, to facilitate coupling with cars having other forms of couplers, and higher or lower platforms, the invention being an improvement on two former patented inventions of the same inventor.

A car coupling has been patented by Mr. John M. White, of Terre Haute, Ind. The coupling pin is a peculiar shaped flat piece of metal, pivoted in the drawhead to partly counterbalance, and a shaft extending across the end of the car above the drawhead enables the coupling hook to be raised from either side of the car, with other novel features, the coupler being also adapted to work with the ordinary drawhead and pin.

A stock car has been patented by Mr. Jonathan E. Pierce, of Deming's Bridge, Texas, and David C. Pryor, of Cucharas, Col. This invention covers an improvement on the movable transverse partitions employed for separating the animals, where the partitions are suspended from sliding loop hinges from a horizontal rod, and have at the bottom feet that enter sockets in the floor of the car, the partitions being adapted to be fastened or released by a vertical movement.

A cattle car forms the subject of two patents issued to Mr. Ferdinand E. Canda, of New York city. This invention covers especially a novel construction of gate designed to divide the car into stalls or compartments, one which is strong, durable, and easily moved, and which can be conveniently arranged just beneath the car roof when the car is to be used to transport other freight, as is frequently desired on return trips, the improvement requiring but a single length of chain attached to the upper and lower bars of the gate or partition, in connection with a peculiar arrangement of sprocket wheel and an improved form of spring connecting block.

MISCELLANEOUS INVENTIONS.

Felt articles, such as boots, shoes, and slippers with felt soles, form the subject of a patent issued to Mr. Walter P. Hyatt, of Matteawan, N. Y. This invention covers a novel method of felting a separate sole to a felt boot, etc., and of forming independent felt soles with felt heels made integral with the sole.

A combined ink eraser and burnisher has been patented by Mr. George S. Couch, of Minneapolis, Minn. It is a steel ink eraser, in the form of fine file, having special erasing surfaces, and made also to form a burnisher of the paper after the erasure has been made, the device being simple and neat and of convenient shape to handle for either purpose.

A combined feeder and cutter for toilet paper has been patented by Mr. Henry A. Harrison, of New York city. It is so constructed that a fixed amount of toilet paper will be fed out and cut off each time the machine is operated, and the mechanism, when released, will return automatically to its former position, ready to be again operated.

A micro-audiphone has been patented by Mr. Frank M. Blodgett, of New York city. It is provided with a reed, made of thin metal slotted to form narrow strips, and placed within the inner chamber, to augment the sound waves, together with other novel features, the invention being an improvement on a former patented invention of the same inventor.

A saw frame has been patented by Mr. Henry L. Pratt, of Brooklyn, N. Y. It has at one end a rectangular saw support with projecting studs for receiving the eye of the saw in either of two positions in which it may be placed, with other novel details of a simple and effective device for holding hack saws, and other saws which are strained endwise in bowed frames.

A pedal cover for ogans has been patented by Mr. James S. Foley, of Chicago, Ill. It is a simple mechanism for so hinging a cover to the instrument case over the pedals that it will be operated from the fall board, and opened and closed automatically therewith, whereby dust and mice may be excluded from the instrument when it is not in use.

A pump has been patented by Mr. Riley I. Knapp, of Platteville, Wis. By this invention a piston is arranged to be reciprocated in a cylinder by lifting rods arranged entirely outside of the delivery pipe, with which is a novel arrangement and construction of valves, whereby large volumes of water may be drawn from a well or cistern and forced up to a tank or other receptacle.

A process of preserving eggs has been patented by Mr. John Wm. McKee, of Stoutland, Mo. It consists in first subjecting them to the fumes of sulphurous acid and bromine, and then immersing them in a solution of lime, salt, cream of tartar, citric acid, nitrate of potash, chlorate of potash, borax, alum, and water, whereby it is claimed the eggs will be kept sweet and fresh for several years.

A refrigerator has been patented by Mr. James R. Pershall, of Lawrence, Kan. The construction is such that the refrigerated air can pass freely to the provisions, while the drippings from the ice are prevented from falling thereon, and the tank, filter, and receiver are in contact with the ice chamber, so that the water is being constantly cooled without the impurities of the ice being taken up.

A check rein holder has been patented by Mr. Robert E. King, of Warrenton, N. C. It consists of a framework mounted upon the saddle, with guide rings for the driving reins, and auxiliary check rein, and other novel features, whereby the checking device will be entirely under the control of the driver by means of the ordinary guiding reins, and the necessity of an independent check rein will be obviated.

A springless lock has been patented by Mr. Aaron Park, of Ottumwa, Iowa. It is a lock wherein there are arranged a knob latch, a key-operated bolt, and a bolt operated by a cam-faced manipulating knob, intended to be cheap and durable, but depending entirely upon the force of gravity for the locking of its parts in the position in which it is desired they should remain.

A device for closing openings in pipes has been patented by Mr. Cornelius J. Phillips, of New York city. This invention consists principally of a patch plate, arched in the center and formed with a curved surrounding seat to fit over an opening in the pipe, combined with a cross piece adapted to be fitted in the opening and having a bolt for securing the patch plate in place.

A marking and furrowing machine has been patented by Mr. Jacob Flomerfelt, of Peapack, N. J. The markers or runners are composed of a main body part, and opposite face irons or cutters arranged to project below the bottoms of the bodies of the runners, the device being operative regardless of the unevenness of the ground, and a central disposition of the weight and draught being obtained.

A churn has been patented by Mr. Jas. H. Taylor, of Westfield, Mass. The body is cylindrical in form, made with staves and circular heads, and the dasher may be revolved by a crank, being so constructed as to cause counter currents of cream in churning, there being a peep glass in the cover for inspecting the progress of the butter forming, with other novel features to promote convenience and expedite the work.

A spring balance has been patented by Mr. Hugo Haerter, of New York city. This invention combines a special adjusting mechanism with the parts of an ordinary spring balance in such way that the pointer can be readily brought to the zero point should the scale pan be removed or changed for a heavier or a lighter one, or should a plate or other vessel be placed on the pan to receive the substance to be weighed.

A hand stamp has been patented by Mr. Fred C. Lidke, of Washington, D. C. The stock has a body with an opening fitted to receive a type bar, a rotatable cover plate with an opening which may be brought into and out of register with the openings in the stock, with other novel features, making a stamp especially adapted for canceling and marking postage stamps, and in which the letters may be formed separately and be self-retaining in the stock.

A combined band cutter and grain feeder for thrashers has been patented by Mr. Charles Grover, of Kansas City, Mo. While one end is connected with the receiving end of a thrasher, the other end is adjustably supported by hinged legs, and bundles can be put in the machine on both sides, while there are various novel features, the invention being an improvement on a former patented invention of the same inventor.

A machine for coating emery belts has been patented by Mr. Samuel J. Smith, of Merrimacport, Mass. The emery is contained in a pan held in an annular groove of a disk revolving in a horizontal plane, and the entire surface of the belt, passed over pulleys, is pressed on the emery in the pan, the glue or other adhesive material being applied at the same time, an evener keeping the emery level, and the whole operation being very quickly effected.

A graphic negative film has been patented by Mr. Stephen C. Duval, of New York city. It is a transparent sheet of gelatine, rendered opaque by a coating of colored varnish, with a coating of metallic powder applied to the varnish, so that when the surface is worked upon with a suitable instrument, and the opaque coating removed in lines from the transparent sheet, the artist can see his work as it progresses without having to hold the film up to the light.

A mechanical movement has been patented by Mr. Charles Schirrmeister, of Brooklyn, N. Y. Radial arms are placed at right angles to and projecting from the axis of motion, so arranged that each arm is in a different vertical plane, and the arms being weighted at each end; some of the arms are made hollow and inclose sliding or rolling weights, and the motion is further re-enforced by springs attached to the axis by a lever and eccentric, the device furnishing a means for imparting mechanical power.

A broom attachment has been patented by Mr. Walter E. Nash, of Darlington, Wis. It is a detachable guard, made conformably to the shape of the broom head, with its side edges turned up to fit and clasp both side edges of the broom, and having a tubular handle to slip over the handle of the broom to cause the guard to support the broom below the bound portion of its splints, giving a comparatively rigid action n one side or face of the broom without restricting its elasticity on the other face, the detached guard also serving as a dust pan.

NEW BOOKS AND PUBLICATIONS.

LEHRBUCH DER MINERALOGIE. Von Max Bauer. Berlin and Leipzig, 1886: J. Guttentag. Pp. 562; 588 woodcuts.

This is a most convenient text-book in the science of mineralogy. The work commences by a definition of mineral and mineralogy, and then gives a list: 1, of the principal text and hand books on the subject, including 41 titles; 2, of works on crystallography and physical mineralogy, also 41 titles; 3, of works on microscopic mineralogy, 8 titles; 4, chemical composition of minerals, 11 titles; 5, synthetic mineralogy, 6 titles; 6, determinative mineralogy, 21 titles; 7, occurrence of minerals, 37 titles; 8, journals and periodicals, 24 titles; 9, annuals (Jahresberichte), 5 titles; 10, systems of mineralogy, 11 titles; 11, descriptions of collections, 5 titles; 12, technical and economical mineralogy, 12 titles; 13, history of mineralogy, 4 titles. The author devotes a great part of his work to crystallography and physical mineralogy, the latter embracing such a range of subjects as is indicated by cohesion, tenacity, elasticity, reflection and polarization of light, color, streak, polychroism, and electricity, all applied to minerals. Chemistry comes next, including the natural processes of formation of minerals, decomposition and pseudomorphism, and the like. The last part of the book, 322 pages, is devoted to descriptive mineralogy; the species are arrangad in the following general order: Elements, haloid compounds, sulphides, oxides, borates, carbonates, and nitrates, etc., ending with minerals of organic origin. Sometimes the author is in error as to American localities, as where he attributes Franklinite to the State of New York instead of New Jersey. On the whole, the book is decidedly to be commended. The cuts are mainly crystallographic.

TRAITE PRATIQUE D'ELECTRICITE INDUSTRIELLE. Par E. Cadiat L. Dubost. Paris: Baudruy et Cie, 1886. Pp. 583; 222 woodcuts.

This is the second edition of what proved a useful and acceptable addition to the literature of electricity. The theory of the subject, measurements, batteries, dynamos, and all the appliances are described, the object being to condense the practically useful part, rather than to touch upon purely theoretical ground. Among the batteries we notice an illustrated description of the famous Trouve battery, with the formula and M. Trouve's elaborate description of his method of preparing the solution. Lalande and Chaperon's oxide of copper battery, and Maiche's atmospheric battery are illustrated and described also. Ohm's law is thoroughly elucidated. Secondary batteries, dynamos and electric lamps are treated of, with practical examples of calculations. Much space is given to the subject of the transmission of force. Sections devoted to galvanoplasty, electrometallurgy, telephony, and a short chapter on electric units, etc., close the work. The illustrations are creditable, aiming rather at utility than picturesqueness, in many cases being mere diagrams. The general proportion of parts is excellent, and enough, and not too much, mathematics for the practical engineer appear to be contained. It has no index; a full table of contents only is supplied.

THE TECHNO-CHEMICAL RECEIPT BOOK. Edited chiefly from the German. By William T. Brannt and William H. Wahl. Philadelphia: Henry Carey Baird & Co.

This is a new compilation and collection. Technical terms are avoided so far as possible, and the descriptions are plain and direct, making a book well suited for a constant assistant in the workshop or general ready reference. In regard to the use of receipts, there are always people who will make a careless trial, perhaps neglecting some important point, or not noting the precise terms of the receipt, and then complain at a failure which is only the natural result of their own carelessness. Inexperienced experimenters should make their first trials with small quantities, and repeat their attempts until it is certain that failure does not come from mistake in manipulation or error in the quantities. The value of the book is increased by an elaborate table of contents, topically arranged, and a copious index.

WARM BLAST STEAM BOILER FURNACE. By J. C. Hoadley. New York: John Wiley & Sons.

This is a report of a series of trials, begun in the summer of 1881, of "an apparatus for transferring a part of the heat of escaping flue gases to the furnace, by warming the entering air." The trials lasted nearly a year, and the apparatus has since been in uninterrupted use at the chemical works of the Pacific Mills, Lawrence, Mass., with a result, according to the author, that the warm blast experimented with "seems to afford a means of securing a net saving of 10 to 18 per cent over the best attainable practice with natural chimney draught and with air supplied to the furnace at usual external air temperatures." The boiler tests were very extended and carefully conducted, and every endeavor was made to learn the absolute limitations of economy in coal combustion, a line of investigation in which the author, who personally superintended the experiments, probably has no superior.

HYDRAULICS. THE FLOW OF WATER THROUGH ORIFICES, OVER WEIRS, AND THROUGH OPEN CONDUITS AND PIPES. By Hamilton Smith, Jr. New York: John Wiley & Sons.

In this handsome quarto, full of mathematical formulæ and the tabulated results of many investigations, and illustrated with numerous plates, an effort is made to critically examine all the recorded experiments which have been made with weirs and pipes by German, French, English, and American authorities. Many of the experiments reported upon were made directly by the author, and some of these, formerly published in the Transactions of the American Society of Civil Engineers, have been recalculated to give results slightly differing from the first figures. The work is designed to save labor and be of practical assistance to engineers in a field wherein, heretofore, they have had to make nearly all their calculations almost as if commencing an original investigation on the whole subject.

POOR'S DIRECTORY OF RAILWAY OFFICIALS AND RAILWAY DIRECTORS. New York: Poor's Railroad Manual Co.

To all who desire to do business with the railways of the United States and Canada, in the way of furnishing supplies, making contracts of any kind, negotiating for the introduction of patented improvements, or other purposes, this directory cannot fail to be a great convenience. One can thus readily see how to make applications to first hands in any department of the very extended and important interests which our great railway system represents.

STEAM HEATING PROBLEMS. The *Sanitary Engineer*, New York.

This volume is a republication, in convenient form for reference and preservation, of questions, answers, and descriptions touching problems in the designing and construction of steam heating apparatus, which have previously appeared in the columns of the *Sanitary Engineer*. The book has a good deal of practical information set forth in a very direct style.

OIL AND VARNISHES. Edited by James Cameron. Philadelphia: P. Blakiston, Son & Co.

This book is one of a series of technological handbooks, giving in convenient form a compendium of the information furnished by many larger works, in a style most suitable for use by those engaged in the industrial arts. It is an English publication, so that the classifications, statistics, prices, etc., with which the book is well provided, are those of Great Britain especially.

TOKOLOGY. By Alice B. Stockham, M.D. Chicago: Sanitary Publishing Co.

The author of this volume has had considerable experience in the practice of medicine; she has succeeded in filling its pages with much good advice and many common sense suggestions, designed especially for the benefit of women.

FIRE TABLES FOR 1886. New York: The Chronicle Company.

This is an elaborate compilation of fire statistics, showing the losses in the United States by risks, States, and causes, with other valuable information for fire underwriters and owners of warehouses and others who have insurance on property. A colored diagram, making the frontispiece, shows the causes of the most dwelling house fires in a way that is worth many pages of figures. Defective flues caused the greatest number of these fires; then come, in diminishing proportions, incendiarism, matches, sparks, explosions of lamps, etc., tramps, firecrackers, and cigar stubs being each responsible for about the same number of fires.

THE ADVERTISER'S HANDY GUIDE. 1886. J. H. Bates, New York.

This is a neat little pocket book, containing a directory of the newspapers of the United States and Canada, with record of their circulation, alphabetically arranged, each page of the directory having a blank page opposite for memoranda. The enterprising advertising agent who furnishes this directory bought out the good will of the long-established advertising agency of S. M. Pettingill & Co., in April last.

The American Journal of Archæology and of the History of the Fine Arts for the second quarter of the year contains an excellent selection of interesting reading matter, in addition to its usual illustrations of archæological subjects. The list of contributors is a sufficient guarantee of the value of the number. W. H. Ramsay continues his notes on the antiquities of Asia Minor, and Joseph T. Clarke on a proto-ionic capital from Neandria. The first paper on the Terra Cotta Heads of Teotihuacan, by Mrs. Zelia Nuttall, is both in point of interest and length one of the most important contributions to the number. In spite of all that has been written about these curious objects, and the scholarly speculations they have excited, they still remain an unsolved mystery. But the long discussion has detracted nothing from their interest. The department devoted to current archæological news and periodicals bears witness to the activity which this branch of study now enjoys. As the literature of the subject has so increased in volume as to be quite beyond the reach of even the most persistent students, the very readable reviews of Dr. Frothingham and his editorial colleagues will be found an agreeable feature.

Transactions of Vassar Brothers Institute, Poughkeepsie, N. Y., and its Scientific Section for 1884 and 1885, contains, in addition to the minutes of the meetings, a reprint of several addresses delivered before the Institute, which possess considerable scientific value. In the "Evolution of Science," by the president, Dr. Cooley, is traced the development of that knowledge whose sum we call science, and his plea for the admission of the doctrine of evolution is put upon the ground of an overruling and supreme intelligence. "The Just Claims of Natural Science," by Professor Dwight, is of not less interest. "The Genealogy of the Vertebrata, as learned from Palæontology," by Professor E. D. Cope, is worthy of careful study as being the expression of the most distinguished of American naturalists. "An Empirical Study of Gyrating Bodies," by Dr. C. B. Warring, is a very full statement of the behavior of gyrating bodies, and is illustrated by more than fifty figures "from life." "The Sun Spots of the past few years," by Miss Mary Whitney, contains the results of observations made at Vassar College since the year 1874.

The Ventilation and Warming of Buildings, upon the principles designed and patented by Henry Ruttan, B. R. Hawley, and Isaac D. Smead, forms the subject of a handsome illustrated volume just published by Messrs. Smead, Wills & Co., of Elmira, N. Y. The system explained is represented by companies also in Toledo, Ohio, Chicago, and Kansas City, and covers improvements upon which thirteen patents have been issued.

Patent Screw-cutting and Other Labor-saving machinery and tools are described in a recently

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issued illustrated price list of the Wiley & Russell Manufacturing Co., Greenfield, Mass.

P. Prybil, of New York city, has several specialty catalogues—one of woodworking machinery, one of machinery for working brass, horn, ivory, etc., and one of shafting, giving illustrations and prices for appliances calculated to d a large variety of work.

Received.

REPORT OF THE SUPERINTENDENT OF PUBLIC INSTRUCTION. New York, 1886. Albany: Weed, Parsons & Co., State Printers.

LEVELING BY VERTICAL ANGLES, AND THE METHOD OF MEASURING DISTANCES BY TELESCOPES AND ROD. By August Faul. New York: John Wiley & Sons.

RETAINING WALLS FOR EARTH. By Malverd A. Howe. New York: John Wiley & Sons.

POCKET FIRE INSURANCE CHART FOR 1886. The *Insurance World*, Pittsburg, Pa.

OSBORN'S TABLES OF MOMENTS OF INERTIA AND SQUARES OF RADII OF GYRATION. By Frank C. Osborn. Cleveland, O.: *Engineering Era* Publication Company.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Wanted—Parties with capital to secure patents in this and foreign countries on a very *sensitive* and reliable *Engine Governor*. Address Geo. S. Agee, Burnham (Mill), Howell Co., Md.

The *Office*, a practical monthly journal for business men, office managers, accountants, and bookkeepers. Subscription price, $1. The *Office* Co., A 205 B'way, N. Y.

Emery Wheels of unusually superior quality for wet grinding. The Tanite Co., Stroudsburg, Monroe Co., Pa.

A Catechism on the Locomotive. By M. N. Forney. With 19 plates, 227 engravings, and 600 pages. $2.50. Sent on receipt of the price by Munn & Co., 361 Broadway, New York.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Pumps for liquids, air, and gases. New catalogue now ready.

Haswell's Engineer's Pocket-Book. By Charles H. Haswell, Civil, Marine, and Mechanical Engineer. Giving Tables, Rules, and Formulas pertaining to Mechanics, Mathematics, and Physics, Architecture, Masonry, Steam Vessels, Mills, Limes, Mortars, Cements, etc. 900 pages, leather, pocket-book form, $4.00. For sale by Munn & Co., 361 Broadway, New York.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, polishing compositions, etc. $100 "*Little Wonder.*" A perfect Electro Plating Machine. Sole manufacturers of the new Dip Lacquer Kristaline. Complete outfit for plating, etc. Hanson, Van Winkle & Co., Newark, N. J., and 92 and 94 Liberty St., New York.

Machinery for Light Manufacturing, on hand and built to order. E. E. Garvin & Co., 139 Center St., N. Y.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Send for catalogue of Scientific Books for sale by Munn & Co., 361 Broadway, N. Y. Free on application.

The Knowles Steam Pump Works, 44 Washington St., Boston, and 93 Liberty St., New York, have just issued a new catalogue, in which are many new and improved forms of Pumping Machinery of the single and duplex, steam and power type. This catalogue will be mailed free of charge on application.

Iron Planer, Lathe, Drill, and other machine tools of modern design. New Haven Mfg. Co., New Haven, Conn.

If an invention has not been patented in the United States for more than one year, it may still be patented in Canada. Cost for Canadian patent, $40. Various other foreign patents may also be obtained. For instructions address Munn & Co., SCIENTIFIC AMERICAN patent agency, 361 Broadway, New York.

Grimshaw.—Steam Engine Catechism.—A series of thoroughly Practical Questions and Answers arranged so as to give to a Young Engineer just the information required to fit him for properly running an engine. By Robert Grimshaw. 18mo, cloth, $1.00. For sale by Munn & Co., 361 Broadway, N. Y.

Supplement Catalogue.—Persons in pursuit of information of any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

Planing and Matching Machines. All kinds Wood Working Machinery. C. B. Rogers & Co., Norwich, Conn.

Nystrom's Mechanics.—A pocket book of mechanics and engineering, containing a memorandum of facts and connection of practice and theory, by J. W. Nystrom, C.E., 18th edition, revised and greatly enlarged, *plates*. 12mo, roan tuck. Price, $3.50. For sale by Munn & Co., 361 Broadway, New York city.

Hercules Lacing and Superior Leather Belting made by Page Belting Co., Concord, N. H. See adv. page 30.

Combination Pliers, Gas Pliers, Wire Cutters, Wrench and Screwdriver combined. Billings & Spencer Co., Hartford, Conn.

Cushman's Chucks can be found in stock in all large cities. Send for catalogue. Cushman Chuck Co., Hartford, Conn.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Friction Clutch Pulleys. D. Frisbie & Co., N.Y. city.

Veneer Machines, with latest improvements. Farrel Fdry. & Mach. Co., Ansonia, Conn. Send for circular.

Tight and Slack Barrel Machinery a specialty. John Greenwood & Co., Rochester, N.Y. See illus. adv., p. 28.

Iron and Steel Wire, Wire Rope, Wire Rope Tramways. Trenton Iron Company, Trenton, N. J.

Brass and Iron Working Machinery, Die Sinkers, and Screw Machines. Warner & Swasey, Cleveland, O.

The Dead Cannot be Raised,

nor if your lungs are badly wasted away can you be cured by the use of Dr. Pierce's "Golden Medical Discovery." It is, however, unequaled as a tonic, alterative, and nutritive, and readily cures the most obstinate cases of bronchitis, coughs, colds, and incipient consumption, far suspassing in efficacy cod liver oil. Send ten cents in stamps for Dr. Pierce's pamphlet on Consumption and kindred affections. Address World's Dispensary Medical Association. Buffalo, N. Y.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(1) H. A. L. asks: Does the strength of an electro-magnet depend partly upon the amount of wire upon it, as well as upon the battery? A. Yes.

(2) E. A. M. asks: What is used to color lace ecru? A. Dip it in a solution of coffee.

(3) J. B. W.—Hard wood lumber should not be kiln-dried until marketed and ready for use. It is less liable to crack or become shaky after being cut to required size for use. Wagon and car builders have their own kilns, heated by steam, which is essential for perfect kiln drying. Such a plant may cost from one to two thousand dollars. We recommend you to correspond with lumber dealers in regard te establishing a trade.

(4) T. A. R.—Two to 3 inches in depth is considered a very heavy fall of water in a single storm. Instances have been known of much greater rainfalls. Have experienced a fall of 10 inches in one week in Illinois. A barrel might give a rough estimate of the depth of a heavy rainfall.

(5) S. S. desires a recipe for Worcestershire sauce. A. Mix together 1½ gallons white wine vinegar, 1 gallon walnut catsup, 1 gallon mushroom catsup, ½ gallon Madeira wine, ½ gallon Canton soy, 2½ pounds moist sugar, 19 ounces salt, 3 ounces powdered capsicum, 1½ ounces each of pimento and coriander, 1½ ounces chutney, ¾ ounce each of cloves, mace, and cinnamon, and 6½ drachms asafœtida dissolved in 1 pint brandy 20 above proof. Boil 2 pounds hog's liver for 12 hours in 1 gallon of water, adding water as required to keep the quantity; then mix the boiled liver thoroughly with the water; strain it through a coarse sieve. Add this to the sauce.

(6) L. V. A. asks: What amount of air per minute will be displaced by a parachute falling with 100 pound weight attached? The amount of air displaced in one minute depends somewhat upon the size and weight of the parachute. If the whole weighed 100 pounds, it would descend with the velocity of the wind moving under that pressure for a given area. It is known that air moving at a velocity of 3,960 feet per minute exerts a pressure of 10 pounds per square foot. Then if your parachute weighing 100 pounds had 10 square feet area, it would fall when near the earth at the rate of 3,960 feet per minute, and would displace 39,600 cubic feet of air per minute. Increasing the area of the parachute 10 times, or equal to 100 square feet, would proportionally reduce the speed and displacement. This is for the density of air near the earth; higher up, the speed and displacement would be greater. This unequal density has been the cause of disasters in parachute descents. The velocity gained in the upper rare atmosphere, when met by the lower and denser atmosphere, has made the resistance so great as to collapse the parachute with fatal effect.

(7) W. W. S. asks: Will you inform me, through your valuable paper, of some preparation that will be cooling, to take the place of ice, that will rise as filling between two concentric boxes? A. One pound nitrate of ammonia to two or three pounds water is the best of the simple mixtures for producing cold, where no ice or snow is to be used.

(8) C. V. H. asks: Can you inform me through your Notes and Queries column the probable number of arc electric lamps in use in the United States? A. A little over a year ago the number was estimated, in an address by W. H. Preece, F.C.S., at 90,000. Since that period, assuming that estimate to be correct, they have probably passed 100,000. The American Electrical Directory for 1885 gives for isolated plants alone upward of 10,000 arc lamps.

(9) J. J. K. asks: Is there any way of removing the wrinkles from a person's forehead who has just passed his 21st birthday? A. The wrinkles are doubtless a natural formation, and cannot be removed. 2. What is the Irish population of the world? A. The Irish population of the world, native born, is probably under eight millions; many people make the figures very much larger, but it is by counting as Irish the children of Irish parents born in other countries than Ireland.

(10) C. C. C. asks: 1. How can I make a cell battery strong enough to kill a cat, not to be too expensive? A. You need an induction coil like the one shown in SUPPLEMENT, No. 160, but more powerful, or a battery of Leyden jars charged by an electric machine. 2. What is bird lime, how is it made, and about what is it worth? A. *a.* By boiling the inner green bark of the holly (Ilex aquifolium), and allowing it to stand 14 days to ferment. *b.* By boiling and then igniting linseed oil, or by boiling down varnish until thick and ropy. Care must be taken not to cause a conflagration. 3. What is animal magnetism, and when was it first noticed? A. No one knows. It is probably a mistaken term. It came into vogue in 1775. 4. What and where is the largest cannon in the world, and how far will it shoot? A. De Bange's new gun, described in SCIENTIFIC AMERICAN, vol. liii., No. 1, has, it is said, a range of 11 miles. For comparative sizes of large guns, see SCIENTIFIC AMERICAN SUPPLEMENT, No. 510.

(11) J. H. McN. asks: Is there any known fluid capable of carbonizing paper, or converting it into a conductor of electricity, that is not dangerous to handle? A. In general terms, there is not. Dilute sulphuric acid applied to paper and the latter exposed to heat will carbonize the paper to a certain extent.

(12) L. R. L. asks: 1. What is the velocity of light per second as computed by the best authorities? A. Recent determinations give light a velocity of 185,420 miles per second (Cornu), or 186,380 miles per second (Michelson). 2. What is the velocity of electricity per second, as computed by the best authorities? A. The velocity of electricity for transmission by wire varies from 18,400 miles per second for dynamic electricity to 288,000 per second for static electricity. For submarine cable it depends on the construction, capacity, etc., of the cable, when a direct battery connection is used.

(13) A. W. B. asks whether the free use of common salt at meals in injurious to the teeth. A. No.

(14) Tilsonburg asks: How many methods are there of connecting the wires on the armature, the field magnets, and the line, and what is the object and effect of each? Where can the insulated wire be procured? Will strips of copper ribbon suit for armature and field magnets? A. In general, three methods: *a.* By carrying the same wire around the armature and then around the field. *b.* By dividing the wire as it leaves the armature, and carrying part around the field and using the rest for the line. *c.* Combinations of methods are sometimes used, called compound windings, which are of many kinds. In first method, resistance in the field reduces the strength of the field, and thereby reduces the current strength. In second method, the reverse is the case. Insulated wire is sold by all electrical supply dealers. Wire is generally used in preference to strips.

(15) O. L.—The term "trap" is used somewhat loosely in geology to designate several varieties of basic, igneous rocks. It includes dolerite, basalt, and greenstone, rocks which are similar in appearance, and which differ little in composition. In structure they are fine grained, and crystalline to granular on fracture. The color varies from a dark gray through different shades of green to black. The first, dolerite, is a mixture of labradorite (feldspar) with angite (a variety of pyroxene), and usually contains some titaniferous iron ore. Basalt is similar, but usually contains its iron ore in the form of magnetite. Small green crystals of olivene (silicate of iron and magnesia) are also found scattered throughout the mass. The greenstones are composed of feldspar and hornblende, with generally some admixture of chlorite (a silicate of magnesia). Trap occurs as a dike breaking through the other formations, and not infrequently connected with a level overflow. It is found in a number of localities in the Rocky Mountains and the far West. Also in the East, in Pennsylvania, New Jersey, and other localities, but has never been found near Louisville.

(16) R. Z. asks: 1. Has the United States Postal Department ever offered any inducements for a stamp or method of canceling stamps on letters more efficient than the methods now in use? A. We think not. 2. Are envelopes folded and gummed at the same operation of machine in making? A. Yes

(17) H. L. E. writes: I have a large English clock which was imported about 50 years ago. Whenever the weights get down to the pendulum, they begin to move, but not keeping regular time with the pendulum. Can you explain this? A. The weight vibrates in a sympathetic manner, but in its own time, from the action of the pendulum upon the air in the case, so that, when the weight reaches the level of the pendulum bob, the air partakes of a vortex motion, which sets the weight also in motion. If the weight was hung at exactly the same height as the pendulum, they would swing together. The phenomenon has long been observed, and is often illustrated by the synchronous vibration of musical instruments.

(18) D. F. writes: 1. A boiler is tested by cold water pressure up to 120 pounds. To what steam pressure is that equivalent? A. 75 pounds pressure allowed. 2. To what height can water be forced by a hydraulic ram, the fall from the supply to the pump being 6 feet? A. From 60 to 100 feet, delivery decreasing with increase of height. You may utilize 40 per cent of the whole flow at 60 feet.

(19) R. E. M. writes: What size overshot wheel do I need, having 4 feet fall of water, to make two horse power, said power to be transmitted 150 feet? A. You will require an overshot wheel of 4 feet in diameter, 6 feet wide, with buckets to carry the water from the spill or weir 6 inches deep by 6 feet wide, allowing for waste, and 6 inch wallow in tailrace. For friction and transmission by shafting, add 1 foot to width of wheel and weir, making it 7 feet wide.

(20) R. H. K. desires a recipe for a shaving soap which will soften the beard in cold water, and will remain for a good while on the face. A. We would advise you to try the following shaving cream. Take of:

Curdsoap	8	ounces.
Almond oil	2	"
Glycerine	1	"
Spermaceti	½	"
Carbonate of potassium	¼	"
Water	16	"

Cut the curd soap into shreds, and dissolve it by the aid of a water bath in 14 ounces of water. Dissolve the spermaceti in the almond oil, and while warm mix it with glycerine, potash, and remainder of the water; transfer to a warm mortar, gradually and steadily incorporate the warm soap solution, and continue to stir until a smooth paste is formed. With this incorporate a suitable perfume.

(21) M. H.—Vacuum has but one technical meaning, void space with neither gas, air, nor solids within its boundaries. It can be produced artificially as to air to less than a millionth of its volume.

(22) J. H. S. asks the diameter of a screw for a propeller to steam 20 miles an hour, and the rule for finding the diameter of any screw to propel a vessel at any rate. A. See SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 278, 181, 101, 208.

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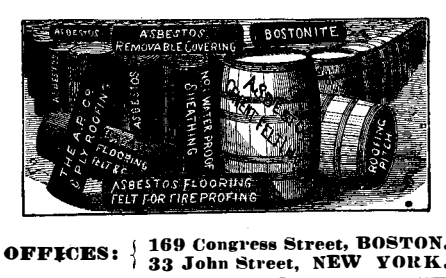

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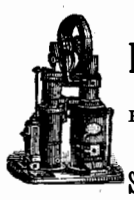

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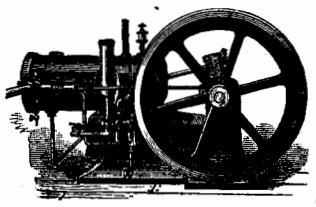

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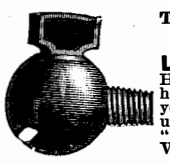
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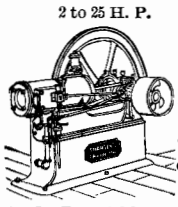
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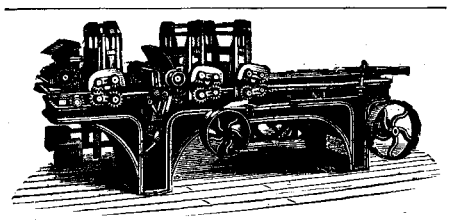

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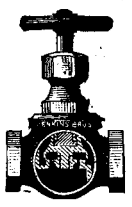

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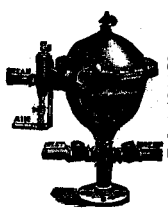

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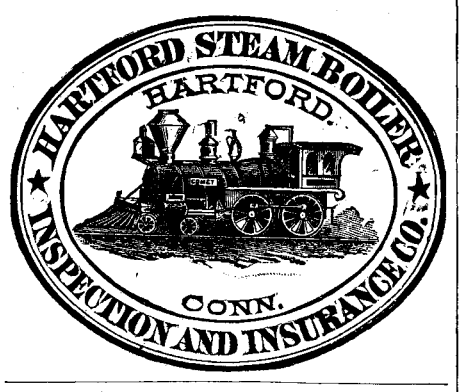

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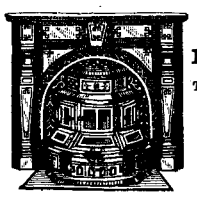

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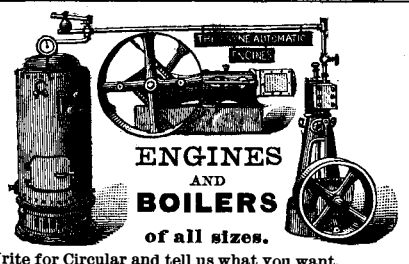

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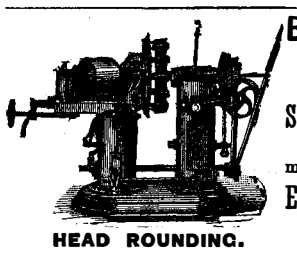

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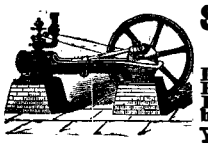

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